THE

# Practical Teacher

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Edited by JOSEPH HUGHES.

'*Knowledge is proud that he has learned so much,*
*Wisdom is humble that he knows no more.*'—COWPER.

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## Hygiene.

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### SHELTER AND WARMING—(*continued*).

The *site* of the house must be dry; it must not be liable to be flooded by underground streams. The level at which the subsoil water stands should not be liable to great rises or falls, unless the rise and fall is steady and constant, as when it is caused by the rise and fall of the tide, as on the banks of a tidal river. The basement of the house should be above the level of the natural or artificial drainage of the district. A house should never be built on a site from which earth has been excavated, and the hole filled up with 'rubbish.' A house upon a site which has been previously occupied by a notice, 'Dry rubbish may be shot here' is to be avoided as likely to be a pest-house. So also the sites of old ponds or areas which have been formerly occupied as small lakes are not safe places to build on. They will be liable to be flooded in rainy seasons, and their subsoil is probably polluted by organic *debris*.

*Walls.*—The walls of a house should not abut upon the side of a hill; that is, no wall should have the natural earth subjacent to it and rise above the level of the floor. No house should be a lean-to against rock, but air should circulate all around the walls. Houses in pits may be warmer, but they are not likely to be as healthy as houses upon a hill-top. The ground should always slope away from the house in all directions so that the surface drainage shall be from the house and not towards it. It is not right to allow any vegetable *debris*, like to garden mould, to be left within the four walls of the building. It should all be removed, and not be allowed to be used in the manufacture of mortar. I have an idea that much of the scarlatina which invades new houses is connected with the character of the bricks and mortar with which the houses have been built.

A subsoil loaded with organic *debris* contains an immense amount of carbonic acid, etc., which is displaced upwards when the subsoil water is rising. This assists to render the air of such a district distinctly miasmatic, and as the subsoil water subsides, that district is liable to produce a class of aguish complaints, to an intermittent class of fevers, the cause of which is not always clear to an ordinary observer.

All walls below the level of the soil should have a dry area around them, so that the earth may not come directly into contact with the brickwork or other materials of which the wall is constructed. Solid beds of concrete make the best foundations, and are easily constructed in districts in which gravel is to be found. Bricks—unless they are made of true clay—are too porous for the purpose: when common bricks are used there should be a layer of slate or other non-porous material inserted throughout the whole thickness of the wall, somewhat below the level of the floor, so that damp may not rise from the subsoil into the brickwork. This plan, however, has its disadvantages; for in wet seasons, if the bricks are very porous, the absorbed rain cannot descend, and has to be evaporated, or poured out on to the floor, and thus tends to render such a house colder than that in which a damp course has not been interpolated. Perforated and impervious bricks are better than slate, for they will allow water to descend, they put an impediment in the way of its ascent, being free from the power of capillary attraction, and water will not pass upwards through them.

It is usual to leave a clear space between the inner and the outer layers of bricks in the wall of a house, which is capable of being ventilated by the insertion of air bricks. This plan has also some disadvantages: it allows of foul air finding its way into a building when the drains are wrongly constructed. It is argued that the air space between the outside and inside of the wall tends to keep the house warmer than it would be without such interpolation. I doubt it, unless ventilation be altogether dispensed with, in which case no woodwork must come into its construction, otherwise dry-rot is certain sooner or later to supervene.

The loss of heat by outside walls is considerable, and is much increased by the porosity of the material of which the wall is constructed, but so is also the healthiness of the house. For if the walls are not porous, the ventilation of the interior must be much more decided than when the materials allow of ventilation. This is well shown in the more unhealthy con-



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dition of stone houses (such as the Glasgow houses), with those built of brick, and which are often styled 'jerry' buildings. The stone houses do not ventilate well. The inhabitants close the air passages, and suffocate themselves with foul air. Jerry buildings cannot become so foul, for ventilation takes place to some extent in spite of the inhabitants. The loss of heat by walls will be in a direct ratio with the conducting power of the material of which the wall is built. The temperature of a dwelling is, therefore, intimately associated with the character of the materials of which it is built; it is urged that basement rooms below the level of the ground are kept warmer by reason of the absence of radiation from outside walls. The temperature of basement rooms will approach nearer to a mean annual temperature than those at the top of a high building, for the diffusion of the temperature between the inside air and the outside air will be in an inverse ratio to the thickness of the walls. Walls must be kept dry if they are not to lose heat: damp walls are very uneconomical, and should always be cured when it is shown to be due to absorption of water. The cure is to be effected by removing the water or preventing its absorption. Absorbent bricks must be protected by unabsorbent stucco, or cement, when drifting rain is the cause of the dampness, whilst proper coping, well-formed eaves, and good water-spouting are necessities in all cases. The loss of heat by walls is influenced by their thickness, by the material, by porosity, and by character of internal lining; anything which lessens porosity, lessens the loss of heat; but, on the other hand, more perfect ventilation is required in consequence. An impervious polished surface, which may be washed with soap-and-water, is the best covering inside, but then, moisture from the breath or damp air condenses on its surface, and buckets of water may run down and flood the floor if the walls are allowed to get cold. Paper, plaster, wood, are all absorbent, and require to be renewed sooner or later, to keep them healthy. Metallic walls are too cold; corrugated iron must be covered with wood or felt to make it fit for a living room. Iron rooms may do for temporary purposes, but unless match-boarded are unfit for continuous occupation.

Parian cement makes the best internal covering, but it is too costly for common use. Glazed bricks or tiles are only fit for cellars and passages. Well-tempered plaster—or better still, one made with Portland cement—well mixed with good sand, will make the best material for inner walls. Roman cement is sometimes used because it is cheaper, but it absorbs moisture, and does not bear the alteration in the tension of the air so well as Portland cement does, especially if that air is liable to be contaminated with carbonic acid or ammonia salts.

It is much better to distemper or paint the walls than to paper them, unless the latter is frequently removed and renewed. Papers are absorbent and at present unwashable, though we are promised a paper from Japan which is said to be washable and persistent.

The pigments used in colouring papers are often injurious to health. Arsenic has been, however, all but driven out of the factory, but strict supervision should be exercised when putting up papers, as to the character of the pigment used. Flock-papers are always bad for the dust which they give off and for their absorbent character. Glazed papers are best, provided there is no dangerous metallic pigment in their tissue. Arsenic is also sometimes used in distempering walls; it is equally dangerous with an arsenic paper. The order of safety for wall-covering is—

1. Parian Cement.
2. Glazed tiles, set in Portland Cement.
3. Portland Cement.
4. Ordinary plaster, painted in oil.
5. Plaster walls frequently limewhited.
6. Varnished wood.
7. Glazed papers; all others should be excluded.

*Floors* should never be placed directly upon the earth; there should always be an air space between them and the soil beneath. The Romans had flues beneath their houses, which were heated by fires kept up in the basement of the house. The air space provides for dryness. No drain should ever be allowed to pass beneath the floor of a house. If no air space is provided, then the floor must be laid on concrete, and the wooden blocks which should form the floor laid in asphalte. This plan is now adopted for the formation of school floors, and is an admirable improvement upon the former plans. Cement, stone, concrete and brick are too cold for flooring, except for passages and rooms which are not occupied for habitation. When the floor is not in blocks laid in concrete, the wood should be tongued, so as to prevent the accumulation of *debris* beneath. A wooden floor should not be washed, but dry-scrubbed, and every joint should be perfect, so that no material can get beneath the floor. The only wood fit for use is pitch pine or well-seasoned oak; it should be well oiled, then beeswaxed, and thoroughly polished; a damp cloth should then be used every day to remove dust and other *debris*; new wood for flooring is altogether wrong. Carpets are comfortable, but they are not hygienic; they harbour dust and prevent that true cleanliness which is the base of hygienic perfection.

*Roofs.*—The outer covering of a house must be perfectly impervious to moisture. Thatched roofs are no doubt picturesque, and may be impervious, but they may not be so, and are not to be encouraged. When iron, lead, or slates are used, it is necessary to have some non-conducting material beneath to prevent the loss of heat, which would otherwise ensue. Slates should be laid upon close-boarded roofs covered with felt. The loss of heat is materially prevented by the lath-and-plaster ceiling, which is generally interposed between the true roof and the occupied room; between these is an interspace which assists to prevent the loss of heat. The loss of heat from glazed roofs and skylights, in which a ceiling is inadmissible, is very considerable.

It is the custom in some parts of the country to limewhite the slates in the Dog Days; it assists very markedly to keep a house cool.

The windows in a given room should reach to the level of the ceiling; if they cannot do so, some provision must be made for ventilating the portion which is above the top of the window. It is customary for some local authorities to insist upon parapets being placed between separate houses, as being protection against fire; this is necessary as between one house and another which is attached to it, that is between semi-detached houses; but parapets are mistakes as between distinct and detached houses, they are likely to lead to flooding in stormy weather, in consequence of the rain-water pipes being blocked

with dead leaves or other material, whilst the influence of frost upon the flushing which has to be used, introduces an element of mischief, so that the slight assistance which such an erection becomes against the spread of a possible conflagration is certain sooner or later to render the house damp, and lead to considerable expense. Eaves, well provided with strong spouting, which will also allow snow to fall off quickly, are better than a parapet; but when there is a lean-to green-house below, it is certain also that the glass will be broken sooner or later by the fall of snow from the slates above. This misfortune should be avoided by never placing a green-house in such a position.

*The Aspect.*—The house should be sheltered by some protection from the east and north-east winds. If in the country a belt of trees may be useful, but they must not be too near, so as to impede ventilation. A site which is decidedly foggy whilst the neighbourhood is not so, is a bad one for houses to be built in: hollows and bottoms of valleys are to be avoided.

*(To be continued.)*

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## The New Class-Subject, 'Elementary Science.'

*(What to teach, and how to teach it.)*

BY RICHARD BALCHIN.

*(Continued from page 53.)*

IN this article the lessons for Standard V., of which the syllabus appeared in the October issue of this magazine, will be concluded. Following last month's notes, we have:—

### LESSON XLIV.—SULPHUR.

Chief compounds. The metallic sulphides have already been noticed. Recapitulate facts concerning iron pyrites, copper pyrites, galena, and blende; and again show specimens of these ores. Note that in all cases of working the ores, the sulphur is first driven out by heat. The composition of these metallic sulphides can be shown synthetically; and the experiment presents an opportunity for recapitulating the meaning of 'analysis' and 'synthesis.' Let the vapour of sulphur pass into a vessel kept hot. In this vapour, a strip, or very fine wire of copper, or tin, or lead, will burn spontaneously, the result of the combustion being the respective metallic sulphides. In the case of zinc or iron, the strip or wire must be introduced red hot. This is done by dipping the end of it into melted sulphur and igniting before placing it in the vapour.

The boys have already heard a good deal of the bisulphide of carbon, $CS_2$, in which we dissolved phosphorus, in order to show how readily the latter combines with oxygen. As seen by the boys, $CS_2$ is a tolerably clear liquid, with an exceedingly disagreeable smell. Such liquid is the gaseous $CS_2$ in an aqueous solution. It may be made in the following way. Boil some sulphur, and allow the vapour to pass over red-hot charcoal in the combustion tube, as described in a previous lesson. The gas $CS_2$ is formed, and readily dissolves in water.

(*Note.*—This bisulphide of carbon is a dangerous compound. On no account should the boys handle it. It is very volatile, and the vapour inflames—even explodes—if brought in contact with a light. Only to-day I have heard of a case where a bottle of $CS_2$ was accidentally left unstoppered on the table. The vapour rose and spread around; some of it condensed on the table near the bottle. In a few seconds the cloud reached a spirit lamp near, and a serious explosion was the consequence.)

Sulphuric acid, or oil of vitriol, is the most important compound of sulphur. More than 200,000 tons are made annually in England. The burning of sulphur in air, or in oxygen, forms sulphur dioxide, $SO_2$ (sulphurous anhydride). The sulphur burns with a violet flame. This gas dissolves in water, and renders the liquid acid, owing to the formation of sulphurous acid, $H_2SO_3$. The further oxidation of the sulphur, which, however, cannot be brought about by heat alone, gives $SO_3$, sulphur trioxide (sulphuric anhydride), which, in combination with water results in the formation of sulphuric acid, $H_2SO_4$. Here may be explained what is meant by '*de*oxidation,' as also what is meant by 'a reducing agent.' For if sulphuric acid be boiled with a metal—for instance, mercury or copper—a gas comes off, which is the dioxide, $SO_2$; thus:—

$$\left.\begin{matrix}Hg\\Cu\end{matrix}\right\} + 2H_2SO_4 = \left.\begin{matrix}Hg\\Cu\end{matrix}\right\} SO_4 + 2H_2O + SO_2$$

Sulphuric acid is made on a large scale by burning sulphur on an iron plate, on the floor of a special kind of furnace, to which a regulated quantity of air is admitted. As the principles involved in this manufacture are very instructive, it would be well to make a separate lesson of it, and have a few rough drawings ready. The first result of the burning of the sulphur in such a furnace is the formation of sulphur dioxide, $SO_2$. On the iron plate, near the sulphur, is placed an iron pot containing a mixture of nitrate of sodium and sulphuric acid. Nitric acid is generated. The mixed vapours of nitric acid and sulphur dioxide are conveyed to chambers in which steam is admitted continuously. The nitric acid is deoxidised and becomes nitric oxide. The liberated oxygen combines with the $H_2SO_3$, and forms $H_2SO_4$. This collects on the floor of the chamber and is drawn off.

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The remaining lessons of the course treat of chemistry as applied to agriculture. These, however, the teacher will most probably omit. I used at one time to include them, but now find it necessary to devote the remaining fifteen lessons to a recapitulation of what has been gone through and a repetition of the most suggestive experiments.

It will have been observed that in treating this subject of chemistry, I have proceeded upon the supposition that there is no laboratory attached to the school, and that, consequently, all the experiments and work have been performed by the teacher himself, in front of the boys, on an ordinary table in an ordinary class-room. With boys in Standard V. nothing further should be attempted. But everybody will admit that the chief benefits—educational, I mean—to be derived from the study are missed if boys are allowed to complete their course of elementary science without having had practical work in a laboratory. I therefore feel, that the boys in Standards VI. and VII. should certainly be set to work, for at least three hours a week, in the chemical workshop. Do not let any one be

alarmed at this, or think it is a new thing. If anybody had, twenty-two years ago, paid a visit on a Wednesday afternoon, to my old British School, he would have found, sitting at a long table, about thirty boys, all busily engaged in simple chemical operations. All the apparatus they used were made by themselves, and the chemicals bought with their pocket-money.

To carry on this kind of practical work properly, it is absolutely necessary that there should be a chemical laboratory to every large school. I find that the School Board for London has decided to erect a laboratory in connection with the Plumstead-road school. It is intended to be for the more efficient teaching of the specific subjects, and is to cost £678. This is a step in the right direction, and I hope the Board will go forward. From conversations I have had with Dr. Gladstone on the subject, I gather that such *is* the intention of the Board, but that we must 'hasten slowly,' for fear of the inevitable outcry.

With a view of preparing for such instruction, I propose arranging a syllabus of lessons in 'Elementary Science' for the next Standards, viz., VI. and VII., which shall embrace a year's work in a chemical laboratory. Hence my future articles might be headed 'Practical Chemistry in Elementary Schools,' or, 'What a Boy can do in a Laboratory.'

As to the chemical workshop itself, I may say that none of the plans given in 'Science Form, No. 1013,' which is to be had of the Secretary of the Science and Art Department, South Kensington (price 1s. 6d.), seem to me exactly suitable for our purpose. We want a school-workshop and laboratory combined, where there should be not only the usual fittings for elementary chemical work, but also a carpenter's bench, a lathe, and a small forge. I will assume that such a shop will be utilised by (1) boys in Standards VI. and VII., (2) by pupil-teachers who wish to pass in Subject X. (Inorganic Chemistry), and (3) by head and assistant teachers in the preparation of lessons. I consider this last point one of very great importance. I have found that most of our assistants are very clever indeed at mechanical work. I see no end of things that these assistants would construct for the purpose of illustrating their lessons, if only they had a properly-fitted shop to work in. With a carpenter's bench and lathe, my present staff of assistants would, with the help of some of the elder boys, willingly spend an hour or two every week making models or cases, and numberless little contrivances which we want, but cannot purchase. Such manual labour would be of immense benefit to the teachers themselves, and very valuable to the boys, who would get to feel an interest in handicrafts, and be less likely to hanker after 'genteel' clerkships.

It is extremely inconvenient to have to prepare the experiments for a lesson *in* the class-room before the boys. Such preparation should be carried on in a separate room, fitted with proper appliances. Suppose, for instance, an assistant is to give a lesson on 'Hydrogen' to Standard V.; the time, eleven o'clock. This will, I presume, be immediately after the ten minutes' recreation in the playground. If the head teacher has time, *he* will get everything ready. If not, the assistant must spend at least half an hour in the laboratory before eleven. It may be asked: 'Who is to look after the boys during this half-hour?' Well, if the discipline in the division is good, a monitor can be left in charge while the boys are doing the work set by the assistant; but if the discipline be not good, then the preparation must be done *out* of school hours, until the assistant improves as a disciplinarian.

With respect to the fitting-up of that part of the workshop devoted to chemical operations, I will assume that it is to accommodate twenty-four boys working at a time. The room should be sixty feet by twenty, lighted by windows at the sides, and by a skylight. There should be six working tables, each divided into four parts by lines joining the middle of the sides; this would give twenty-four benches. At either end of the table should be a sink and basin, with tap and water-supply; that is, one sink between two workers. From the centre of the table where the divisions cross, there should rise the 'fume' chimney, constructed similar to that at the Finsbury Technical College. This is, of course, continued downwards, and connected with the main ventilating shaft. Around the chimney is fitted a shelf for a few bottles, etc. The central part of the table is surmounted by a hood. Each division, or bench, has under it a drawer and cupboard, fitted with partitions, shelves, etc. Also, there should be the necessary gas-jets. The apparatus and chemicals supplied to each student would be about the same as the list given on page 46 of the 'Science Directory' (South Kensington, price 6d.).

Besides these twenty-four benches, there should be a large table for the teacher's use, and a good supply of shelves and wall-cases. The stove, or furnace, should stand about four feet from the wall, so that the portion of the iron flue between the stove and the wall could be used for sand-baths, etc. The top of the stove should be a stout iron plate, to serve as a table for drying, evaporating, etc. Over *this* there should be a hood and fume-chimney combined, leading into the stove-flue.

In next month's article I will give a syllabus of a year's course of lessons, with laboratory work, for Standards VI. and VII.

*(To be continued.)*

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# How I Teach Domestic Economy.

BY MRS. WIGLEY.

Author of 'Marshfield Maidens,' 'Our Home Work,' 'Workers at Home,' 'Royal Series Domestic Economy,' 'Cookery and Home Comforts,' 'The Merryweathers,' 'Thoughts,' etc.

## CHAPTER III.

### DOMESTIC ECONOMY—WHAT IS IT?

IT may perhaps be as well that every now and then I should submit to you the course through which I myself have taken some of the lessons given in this subject. Please remember that I do not say it is the *best* course to take, or by any means *the only* course to take. It is quite time every teacher felt, in a modified sort of way, 'My own plan may be as good as any one's, and perhaps better.' We have had enough of stereotyped forms in teaching. Let every teacher trust herself more, and trust other people less, and the science and art of teaching will be exalted, and not lowered, insomuch as it will call forth more originality, more energy, and greater enthusiasm.

So, in offering in these papers anything approaching to *notes of a lesson*, I do so merely as an old teacher, who throws out a suggestion which may be

useful to those who have had less experience than herself.

I will only add that what follows indicates precisely the course through which the lessons were taken, with standards iv., v., and vi. in an ordinary elementary school.

Teacher writes 'Domestic Economy' on the blackboard, and proceeds thus—

'I have written two words on the blackboard; read them to me.' 'Domestic Economy.' 'Yes; both words of three syllables, and yet very learned words all the same. They are not words which our dear Saxon grandmothers used in the old days. We have had to borrow them, as we have done many other words, from the languages of other people. Watch me while I write something more about them.

"Domus"—"a home or family;"
"ic"—"belonging to."

'Read these words and their meanings—

'Yes, Domus—ic, belonging to a home, or family, we have changed into our word "domestic," and have left it the same meaning.

'What is the meaning of domestic? What words is it derived from? Repeat all together.'

'Domestic—belonging to a home, or family.'

'Now watch me again with the other word while I write—

"Oikos"—"a house."
"Nomos"—"law or management."

'From these two words we get "Economy," which means "the management of the house, or dwelling." Now, who can put the two words together and tell me all they mean? Not quite right. Let me help you with the board. There, now, I have written "Domestic Economy—the management of the dwelling belonging to the family." Or, in other words, we might say, "Domestic Economy is the right management of the home and family."

'Now, who has to manage the home?' 'Mother.' 'Yes; and if she is away?' 'My aunt.' 'My big sister.' 'Yes, the management of the home falls into the hands of women. Whose place is it to manage the home?' 'A woman's place.' 'Yes, it is *our* place—the place of women and girls to manage "*the home*."

'Now, what is a home?' 'Where we live.' 'Yes, but we will have a better answer than that. It is quite possible to live nowhere in particular, you know. Tell me who lives in your home.' 'Mother and father.' 'Our baby.' 'My brothers and sisters.' 'Grandmother.' 'Quite right; and what do you call all these dear people together?' 'A family.' 'That's it. Then a home is the dwelling-place of'—'A family.' 'And in managing the home mother has not only to think of the dwelling, but of'—'The family.' 'And whatever she does, is that her family may get some benefit.'

'Now, what is there in the home that mother must see to for the sake of the dear ones?' 'The meals.' 'The clothes.' 'The washing.' 'The cleaning.' 'Keeping things right.' 'Yes—

"From dawn of day till set of sun
A mother's work is never done."

And notice what a great deal there is to do about every one of the things you named. Look at the first. I have written it down for you.' 'The meals.' 'Tell me some of the things mother must do before we can have dinner.' 'She must go to market.' 'Mother must cook it.'

'Yes, mother must know all about marketing. She does not want to be cheated, so she must know the right'—'price.' 'She does not want to look silly, so she must know'—'the names of the joints.' 'And she does not want bad food, so she must know'—'if it is good.' 'And then, when her purchase is made, what else must she do?' 'Get it ready.' 'She must cook it.' 'Yes, but how?' 'In the best way.' 'Certainly; but how may that be?' 'She must boil it.' 'Roast it.' 'Stew it.' 'Fry it.' 'Grill it.' 'Bake it.' 'Quite right; food may be cooked in all those ways. Now tell me *when* it must be ready.' 'In time.' 'Yes, and in order that this may be managed, what must mother be herself?' 'Punctual.' 'Industrious.' 'Careful.' 'Thoughtful.' 'So she must. Mother must be a good manager to have meals ready always in time. Ah, it takes a very clever person to carry out domestic economy.'

'And there are other things to be seen to beside meals, and the same wisdom has work to do in everything. What keeps mother from getting tired of doing so many things?' 'Her loving heart.' 'Yes, it needs "*a clever head*" and "*a loving heart*" to manage a home well. Now tell me, what is managing a home called?' 'Domestic economy.' 'Whose place is it to manage the home?' 'A woman's place.' 'What things will she have to manage?' 'The food.' 'The clothing.' 'The washing.' 'The cleaning.' 'The marketing.' 'Yes, and ever so much more. And what two things will she need before she can do it well?' 'A clever head and a loving heart.'

## LESSON II.

### DOMESTIC ECONOMY, ITS END—HEALTH—HAPPINESS—AND PROSPERITY.

'You told me the other day some of the things which had to be attended to in the home. Tell me them again.' 'The food.' 'The clothing.' 'The washing.' 'The cleaning.' 'The marketing.' 'Yes,' and we said that the one who had to manage so many important things would need "*a very clever head*" and "*a loving heart.*" But why must all this trouble be taken? Why *must* mother prepare food for you to eat?' 'Because we should die unless she did.' 'Oh, no, you need not. There are plenty of things sold now-a-days ready cooked. There are tinned foods—meats and soups, and there are pies and puddings at the pastry-cook's, and there are joints at the eating-houses. Why does she not get a tin of roast beef for you, instead of cooking it herself?' 'We should get tired of tinned meats.' 'Yes, so we should, I have no doubt. But would that matter?' 'Then we should not eat them.' 'Well, then the money would be saved, would it not?' 'Please, ma'am, we must eat something.' 'Oh, indeed! why must we?' 'We should get ill and die if we did not.' 'Ah, now we have it; we must eat food that is good and food that we can enjoy, or we shall grow weak and sickly, instead of "*healthy.*" Let me write this word down for you. It is a very important word. All good home managers try very hard to keep their family "*healthy.*"

'But there are the other things—the clothing, the washing, and the cleaning, and so on. We need not trouble about those so much, surely. Why do we not roll ourselves up in a blanket, and have done with the

fuss of making and mending and washing and ironing and buttons and strings, and all the rest?' 'It would not be comfortable.' 'The cold would get into the cracks.' 'We should feel clumsy.' 'We should not be able to work so well.' 'We should not feel snug and warm.' 'We should not look so nice.' 'All quite right again. We must have clothing to keep us warm and comfortable, and that we are not ashamed to wear. If we are cold and miserable and worried and uncomfortable, all the good food in the world won't help us much, for cold and miserable and uncomfortable people are not "*healthy*."

'And then about the cleanliness. What things must be kept clean?' 'Everything.' 'The house.' 'The clothes.' 'The windows.' 'Us.' 'The furniture.' 'All of it' 'So it must—ourselves, all we wear, and all we use must be beautifully clean. Dirty things are horrid; they feel bad; they smell bad; they look bad; they *are* bad for all of us. No one who is not clean can be "*healthy*."

'Now go over this again. If we are to be healthy we must be'—'Properly fed.' 'Properly clothed.' 'Properly cleansed' 'And all these things must be attended to by those who'—'Manage the home.' 'Or who carry out'—'The Domestic Economy.'

'And there is something else I want you to notice. Once I saw a dear little girl; she had eaten her dinner, had her hands washed, and her clean pinafore put on, and she clapped her little hands, and said, "Dolly so nicey, feel so goody; nice din-din, clean pinny; now Dolly play nicely, plenty, much." What did she mean?' 'That she felt comfortable.' 'That she was happy.' 'That was it. Her proper food and proper cleanliness had produced "*comfort*," and out of that comfort grew "*happiness*." It is the same with all of us. Not even big people can feel happy if their comforts are not attended to. So mother has something else to think of than feeding you and keeping you clean. She wants to make you "*healthy and happy*."

'Just now, when you were telling me of going to market, we talked of eating-houses. Why do we not buy our food there?' 'The meat might not be so good.' 'No, perhaps not. The people would not be so careful in choosing it and cooking it as mother would be. But there is another reason yet.' 'It would get cold.' 'Yes, it might, and warm meat is best for us; but there is still another reason.' 'It would cost more.' 'Ah, that's it. It would cost a good deal more, because the shopkeepers must charge for their trouble, and the fire, and so on. Now, supposing a mother did not care to get the dinner ready, and she sent to the cook-shop on Monday, and on Tuesday, and on Wednesday, what would happen on Thursday?' 'All the money would be gone.' 'Or if she had money to send for more dinners every day, what would happen when Tommy's shoes wore out, or the landlord came for his rent, or the man called for the taxes?' 'There would be no money to pay for them.' 'No—no money for shoes nor rent. That would be a pretty state to get into. No rent—then no house to live in. No shoes—then a poor little barefooted boy.

'Now think about this. If mother did not make the most of the money and spend it wisely, then the family must go to "*ruin*."

'Oh, how much women and girls have to do when they manage a home, and what a wonderful science that is which teaches all about this home management! What is that science called? What does it teach? What things have to be attended to in managing a home well? And what does every good manager want her family to be? Read the words from the board:—

"1*st*—*Healthy*.
"2*nd*—*Happy*.
"3*rd*—*Prosperous*."

'So she looks to their food, clothing, cleanliness, and a good many other things. Then she attends to everything likely to make them comfortable. She has to take care of the money, and save all she can. I think you will feel that the most wonderful and useful science in the world is "*Domestic Economy*."'

(*To be continued.*)

—o—

# Lessons in Latin.

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(*Continued from page* 66.)

## KEY TO EXERCISES.

### EXERCISE 45.

#### A.

1. I do not agree with those who think that souls perish at the same time with (their) bodies. 2. True friendships are with very great difficulty found amongst those who busy themselves in the republic (matters of state). 3. We are greatly delighted in mountainous and woody places, in which we have spent some time. 4. Hope alone will console man in miseries. 5. We measure great men by (their) valour, not (their) fortune. 6. The Scythians did not seek (desire) gold and silver; they fed on milk and honey; they used the skins of wild beasts. 7. That worship of the gods is the best, that we worship (Eng., 'which consists in our worshipping') (them) with a pure and entire mind. 8. Having performed all the duties of life, he enjoys that rest which he has deserved. 9. Elephants always go in flocks; the oldest leads the line, the next in age drives it.

#### B.

1. Miror te non pœnas eorum timere, quorum facta imitaris. 2. Cæsar omnibus civilibus bellis nullam cladem, nisi per legatos suos, passus est. 3. Non solum ipsa fortuna cæca est, sed eos etiam plerumque efficit cæcos, quos complexa est. 4. Is maxime divitiis fruitur, qui minime divitiis indiget. 5. Qui fortunis alicujus inducti amicitiam ejus secuti sunt, hi, simul ac fortuna dilapsa est, devolant omnes. 6. Ciceronis æquales antiquos oratores magis admirabantur, ipse suorum temporum eloquentiam anteponebat. 7. Maxime admiramur eum, qui pecuniâ non movetur. 8. Maxima culpa est in eo, qui veritatem aspernatur. 9. Fruatur eo quod meritus est. 10. Barbari vescuntur lacte et melle, et pellibus vestimentis utuntur.

### EXERCISE 46.

#### A.

1. The Romans were possessed of standards. 2. God orders you to remember death. 3. Pythagoras called (those) fond of wisdom philosophers. 4. Themistocles made the Athenians skilled in naval war.

5. Are you not already mindful of old age about to come? 6. It is the characteristic of folly to perceive the faults of others, to forget one's own. 7. Miltiades was accused of treachery, because, when he was able to storm Paros, he departed from the fight. 8. In this there was enough ability, but in that no politeness. 9. What gold (there) was, what silver, what ornaments, that Verres took away. 10. God filled the world with all good things and mixed (therein) no evil. In sent. 3 read 'appellavit' for '—ant.'

B.

1. Est natura hominum novitatis avida. 2. Epaminondas adeo erat veritatis diligens, ut ne joco quidem mentiretur. 3. Dives equum, dives pictæ vestis, et auri est. 4. Primus regum Romanorum fuit Romulus. 5. Quid nunc rei geritur in Anglia? 6. Qui alterum accusat probri, is se intueri debet. 7. Adolescentis est, senes revereri. 8. Virtutis est domare, quæ cuncti pavent. 9. Cujusvis est errare, nullius nisi insipientis in errore perseverare. 10. Quis est studiosus horum?

EXERCISE 47.

A.

1. In the 393rd year after the city was founded, the Gauls again approached the city, and sat down (Eng., 'encamped') at the fourth milestone from the city across the Anio. 2. Mithridates, the King of Pontus, who was completely conquered by Pompey in the 688th year after Rome was founded, was well acquainted with the language of twenty-five nations which he had under his authority. 3. Cæsar says to Spurinna, 'Do you know that the Ides of March have already come?' 4. In the 16th year after the kings had been expelled, the people made a sedition at Rome. 5. In the 18th year after the kings had been expelled, C. Marius began to be (become) hateful to the people. 6. In the 528th year huge forces of the Gauls crossed the Alps. 7. Thus, in the 17th year Italy was freed of Hannibal. 8. We wrote (this) on the 9th of April, 1844.

B.

1. Anno regni tricesimo septimo, cum exercitum lustraret, inter tempestatem ortam repente oculis hominis subductus est. 2. Secundo quoque anno iterum Tarquinius bellum Romanis intulit, Porsenâ, rege Etruscorum, auxilium ei ferente. 3. Anno trecentesimo tertio ab urbe condita decemviri creati sunt, qui civitati leges scriberent. 4. Novo bello cum Gallis exorto, anno urbis quadringentesimo sexto, iterum Gallus processit, robore atque armis insignis, et provocavit unum ex Romanis, ut secum armis decerneret. 5. Quingentesimo duodequadragesimo anno post urbem conditam L. Paullus et C. Varro contra Hannibalem mittuntur. 6. Anno quartodecimo postquam in Italiam Hannibal venit, Scipio consul creatus et in Africam missus est. 7. Quinto decimo anno L. Cornelius Sulla ei imposuit finem. 8. Tertium deinde bellum contra Carthaginem susceptum est, sexcentesimo quinto anno ab urbe condita, anno primo et quadringentesimo postquam secundum bellum Punicum transactum erat.

## LESSON XLVIII.

### IMPERSONAL VERBS.

368. In the English expression 'methinks' there is no subject, and 'methinks' is therefore called an impersonal verb. In Shakespeare we find other verbs of the same class, but in modern English we never meet with any, except 'methinks' and one or two of its synonyms.

369. In Latin there were several impersonal verbs, which the student will constantly meet with. All the different moods (except the imperative) and tenses are found; no form in any tense is found but the third person singular. In translating these sentences, the Lat. dat. or acc. becomes the English subject, thus: 'Legem brevem esse oportet.' *Legem*, a law; *oportet*, ought; *esse*, to be; *brevem*, short—only we always take the acc. and the impersonal verb together, thus: *legem oportet*, etc., 'a law ought,' etc.

370. As an intransitive verb can only have as a direct object its own cognate accusative (as it is termed), so an impersonal verb can only have as its subject its cognate noun—*e.g.*, 'me piget,' which we translate into 'it vexes me,' or 'I am vexed;' the noun involved in the root 'pig' being 'annoyance,' and the real meaning of the expression is 'annoyance possesses me'; or 'me oportuit,' 'it behoved me,' which really means 'duty compelled me,' where 'annoyance' and 'duty' are the real subjects respectively.

371. Impersonal verbs which express feelings of the mind are followed by a genitive (probably partitive) of that which causes the feeling—as, 'miseret me tui,' literally, 'it pities me of you,' or 'I pity you.' The object may also be expressed by the infinitive, or by a preposition with 'quod,' or with an interrogative particle.

372. Placet, libet, licet, liquet, are followed by the dative of the person. If the *licet* in 'Mihi licet hoc facere' (Eng., 'It is lawful to me to do this') is resolved into its noun and action, it becomes 'permission is given to me,' from which we see that 'mihi' is the indirect object of the verb.

373. 'Interest' and 'refert'—though the personal forms of 'intersum' and 'refero' are found—are two very common impersonal verbs, and are followed by a genitive of the person, or a feminine ablative of the possessive pronouns, as 'Non tam meâ quam reipublicæ interest,' 'It is not so much my concern as that of the state;' the *interest* being really written for *inter rem est*, and the genitive *reipublicæ* is the limiting genitive depending on *rem*, and the expression literally means, 'concerning the matter of the state.' The things in which one's interest is involved is not expressed by a substantive, but either (1) by an accusative with an infinitive, or (2) by 'ut' with the subjunctive and the interrogative particles.

374. The impersonal verbs libet, licet, piget, placet, pudet, are found in the perfect passive form (with an active meaning) as well as in the active voice. *Tædet* has no perfect active, *pertæsum est* being used; nor has *miseret*, *misertum* or 'miseritum est' (from deponent verb 'misereri') being used.

375. The impersonal use of verbs in the passive voice which govern a dative in the active will be discussed in a future lesson.

376. VOCABULARY 48.

| *English.* | *Latin.* | | *English Deriv.* |
|---|---|---|---|
| It concerns | rĕfert (gen.) | | reference |
| It delights | jŭvat (acc.) | | |
| It becomes | dĕcet (acc.) | P. decuit | decent |
| It wearies | tædet (acc.) | P. pertæsum est | tedious |
| It vexes | piget (acc.) | P. piguit | 3rd R. pigĭt |
| It shames | pŭdet (acc.) | P. puduit | 3rd R. pudĭt |
| It pleases | lĭbet (dat.) | P. lĭbuit | 3rd R. lĭbĭt |

| *English.* | *Latin.* | | *English Deriv.* |
|---|---|---|---|
| It delights | delectat (acc.) | P. delectavit | delectable |
| It behoves | ŏportet | P. oportuit | |
| It repents | pœnitet | P. pœnituit | penitent |
| Christian (adj.) | Christiānus -na -num | R. Christian | |
| Bishop | episcŏpus | G. episcopi | episcopal |
| Learned | doctus -ta -tum | R. doct | doctor |
| Pious* / Filial | pius -a -um | R. pi | |
| To ask particularly | percontari, dep. | R. percont | 3rd R. percontat |
| To leave off | dēsĭnĕre | P. R. desiv or desi | 3rd R. desit |
| Jokes | nūgæ (no sing.) | A decl. | nugatory |
| Indeed | quidem (adv. placed after emphatic word) | | |
| Neither...nor | nec...nec (conj.) | | |
| Way | via | viæ | devious |
| To not-know | nescire | P. R. nesciv | 3rd R. nescīt |
| To come or go down | dēvĕnire | R. R. devēn | No 3rd R. |
| To search for | quærĕre | P. R. quæsiv | 3rd R. quæsit |
| Companion | comes | G. comitis | |
| To live | vīvĕre | P. R. vix | 3rd R. vict |
| Old age | sĕnectus | G. senectutis | |
| To ask urgently for | efflāgĭtāre | R. efflagit | |
| To offend | offendĕre | P. R. offend | 3rd R. offens |
| Pity | mīsĕrĭcordia | G. misericordiæ | |
| Than | quam (conj.) | | |
| Socrates | Sŏcrates | G. Socratis | |
| Commonwealth | res publica | G. rei publicæ (doubly declined) | |
| To confess | fāteri (dep. verb) | | 3rd R. fass |
| Diligent | dĭlĭgens | R. diligent (Exc. 1) | |
| To say | dīcĕre | P. R. dix | 3rd R. dict |
| So much...as | tam...quam (conj.) | | |
| Partly | partim (adv.) | | |
| Crime | scĕlus | G. sceleris, n. g. | |
| Folly | ineptiæ | G. ineptiæ | |
| Innocent | innocens | R innocent (Exc. 1) | |

377. EXERCISE 48.

A.

1. Refert multum (20) Christianæ reipublicæ episcopos doctos et pios esse (38). 2. Tuâ (20) quod (28) nihil (31) refert percontari desinas (sub. for imperat.). 3. Me (35) juvat ire (Eng., 'to go') per altum (20) (adj. used as sub.). 4. Teque (35) tuasque (20) decet sorores (8). 5. Tædet me harum (38) nugarum. 6. Fratris (14) me quidem piget pudetque. 7. Non omnibus (29) (understand 'to do that') quod (27) libet, licet; nec omnes (29) (understand again 'to do that') quod (27) decet, delectat. 8. Viam qui (27) nescit qua (27) deveniat ad mare (11), eum (37) oportet amnem (18) quærere comitem sibi (35). 9. Si (15) ad centesimum (47) vixisset (Eng., plup. ind.) annum (17) senectutis eum (37) suæ (20) non pœniteret. 10. Me puditum est pigitumque tui (35).

B.

1. I am not ashamed to have done (43) this (37). 2. I am sorry that (use 'quod,' see 371) I offended you (sing.) (35). 3. I am not only (45) sorry for my (20) folly (46), but also (45) ashamed. 4. We rather (45) pity those (37) who (27) do not ask (43) for our (39) pity than (those) who (27) ask-urgently-for it (37). 5. Socrates was not ashamed to confess that he (35) did not-know many (20) things (13). 6. Are you not ashamed of this (37) city (7), (this) life (11), (this) light (27)? (repeat 'non' before 'life' and 'light,' and omit Lat. for 'this' in both cases). 7. I am ashamed of gods (27) and men (5). 8. It much concerns me that thou art (38) (sub.) diligent. 9. Cæsar was accustomed (Lat., 'solebat') to say that it was not so much his (20) concern as that of the republic (45) that (6) he should be (38) safe (35). 10. You (sing.) pity others (31); you neither pity nor are ashamed of yourself (35). 11. They are sorry partly for (their) crimes, partly for (their) follies. 12. (He) who (27) is sorry (that he) has sinned (inf.) (3) is almost (20) innocent.

* *Note.—Pius* in classical Latin does not mean our modern notion of *pious*, but expresses the idea of filial devotion, as 'Sum pius Æneas,' 'I am the Æneas who showed such devotion to my father.' But the Christian Fathers of the fourth and fifth centuries used it much as we use its derivative now.

## LESSON XLIX.

### COMPARATIVES AND SUPERLATIVES OF ADJECTIVES.

378. The comparative of a Latin adjective is formed from the positive, by adding 'ior' for the masc. and fem., and 'ius' for the neuter, to its (the positive's) root.

379. All comparatives are of the consonant declension, and in the abl. sing. sometimes end in ĕ, and sometimes in ī.

380. *E.G.*—Positive 'durus,' hard; R. 'dur'; comp., M. F. 'durior,' N. 'durius,' harder; which is thus declined:—

| | SINGULAR. | | PLURAL. | |
|---|---|---|---|---|
| | m. f. | n. | m. f. | n. |
| N. V. | durior | durius | duriores | duriora |
| A. | duriorem | | duriores | duriora |
| G. | durioris | | duriorum | |
| D. | duriori | | durioribus | |
| Ab. | duriore, or -ori | | durioribus | |

381. The comparative (English, 'er') is followed by 'quam' (Eng., 'than'), followed by the same case as that with which it is compared.

382. If the things compared are either the subject or direct object, the 'quam' may be omitted, and the word after it put into the ablative,—*e.g.* 'Vilius argentum est auro (for quam aurum),' 'Silver is cheaper than gold.'

383. All adjectives *may* be, and those which end in 'us' preceded by 'i' *must* be, compared by using 'magis' (Eng., 'rather' or 'more') with the positive, as, 'Quid magis est durum saxo?' 'What is harder than stone?'

384. The superlative is formed from the positive, by adding 'issimus' to its (the positive's) root, as, 'durus,' 'hard'; R. 'dur'; sup., 'durissimus,' 'most (of three or more), or very hard.' They are all adjectives of the O and A declensions.

385. All adjectives *may* be, and those which end in 'us,' preceded by 'i' *must* be, made superlative, by using 'maxime' (Eng., 'very greatly') with the positive—*e.g.*, positive *pius*, superlative 'maxime pius,' 'very filial.'

386. When two adjectives are connected together by 'quam,' one of which is comparative, the other must be also comparative, though not so expressed in English, as 'Triumphus Camilli clarior erat gratior' (not 'gratus'), 'The triumph of Camillus was more illustrious than pleasing.'

387. The formation of adverbs and their comparatives and superlatives will be treated of in Lesson 51.

388. The following seven adjectives make their superlatives by adding 'limus' to the root of the positive—viz., 'similis' (Eng., like), 'dissimilis' (unlike), 'facilis' (easy), 'difficilis' (difficult), 'agilis' (nimble), 'docilis' (teachable), 'gracilis' (slender), and 'humilis' (low)—as positive 'similis,' root 'simil,' superlative 'simillimus' (very like).

389. Adjectives in 'er' form their superlatives by adding 'rimus' to the nom.—*e.g.*, 'miser,' superlative 'miserrimus.'

390. The following adjectives, which are of very frequent occurrence, are irregular, and ought to be carefully committed to memory. It will be noticed that some of them are just as irregular in English, French, Greek, and other languages.

| *Positive.* | *English.* | *Comparative.* | *Superlative.* |
|---|---|---|---|
| Bŏnus | good | mĕlior | optĭmus |
| Mălus | bad | pējor | pessĭmus |
| Magnus | great | mājor | maxĭmus |
| Parvus | little | mĭnor | mĭnĭmus |
| Multus | much | plus | plūrimus |
| Dīves | rich | dĭtior | dĭtissimus |
| Externus | outward | extĕrior | extrēmus |
| Infĕrus | low | infĕrior | infĭmus or īmus |
| Postĕrus | behind | postĕrior | postrēmus or postumus |
| Supĕrus | high | supĕrior | supremus or summus |
| Intrā (adv.) | within | intĕrior | intĭmus |
| Jŭvĕnis | young | jūnior | minimus natu |
| Sĕnex | old | sĕnior | maximus natu |
| Vĕtus (g. eris) | old | veterior | veterrimus |
| Prope (adv.) | near | prŏpior | proximus |
| Ultra (adv.) | beyond / further | ulterior | ultimus |
| | former | prior | primus. |

391. VOCABULARY 49.

| *English.* | *Latin.* | | *Eng. Deriv.* |
|---|---|---|---|
| Destructive | pernisi ɔsus-sa-sum | R. pernisios | |
| Epicurean | Epĭcūræus | G. Epicuræi | |
| To despise | contemnĕre | R. contemps | 3rd R. con- |
| Gorgias (a Greek | philosopher) | G. Gorgiæ | [tempt |
| Celebrated | Cĕlĕber -bris -bre | (con. decl.) | |
| Sophist | Sŏphistes | G. Sophistæ, A decl. | |
| Cost (price) | merces | G. mercēdis | |
| To engage | condūcĕre | P. R. condux | 3d R. conduct |
| Art | ars | G. artis (Ex. I.) | artist |
| Memory | mĕmŏria | G. memoriæ | memorial |
| Mistress(teaching) | măgistra | G. magistræ | |
| Sharp | ăcūtus -ta -tum | R. acut | acute |
| Quick | cĕler -eris -ere | R. celer(con.d.) | celerity |
| Prudent | prūdens | G. prudentis (Ex. I.) | |
| Wise | săpiens | G. sapientis (Ex. I.) | sapient |
| To hold | hăbēre | P. R. habu | 3rd R. habit |
| Safe | tūtus | R. tut | |
| To hope for | spērare | P. R. sperav | 3rd R. sperat |
| Sense | sensus | G. sensūs | sensible |
| To comprehend | comprĕhendere | P. R. comprehend | comprehens |
| Taste | săpor | G. sapōris | |
| Smell | ŏdor | G. odōris | odour |
| Sound | sŏnus | G. soni | resonate |
| Ape | sīmia | G. simiæ | |
| Tail | cauda | G. caudæ | caudal |
| Figure | figūra | G. figuræ | |
| Air | aer | G. aeris, m.g., | acc. sing. aera |
| Dry | siccus -ca -cum | R. sicc | |
| Where | ŭbĭ, conj. | | |
| Damp (moist) | hūmĭdus -da -dum | R. humid | humid |
| Thick, heavy | densus -sa -sum | R. dens | density |
| Eloquent | elŏquens | G. eloquentis (Ex. I.) | |
| To lie (intrans.) | jăcēre | P. R. jĕc | 3rd R. ject |
| To think | pŭtare | R. put | putative |
| Light (adj.) | lĕvis | G. levis | levity |
| Rare | rārus -ra -rum | R. rar | |
| Bird | ăvis, f.g. | G. avis | aviary |
| Swan | cygnus | G. cygni | cygnet |
| Love | ămor | G. amoris | amorous |
| Reward | præmium | G. præmii | premium |
| Industry | industria | G. industriæ | |
| Pleasure | vŏluptas | G. voluptātis | voluptuary |
| Naples | Neăpŏlis | G. Neapolis, f.g. | Neapolitan |
| Flattery | ădūlātio | G. adulationis | adulation |
| Winter (adj.) | hībernus -na -num | R. hibern | hibernate |
| Short | brĕvis | G. brevis | brief |
| Long | longus -ga -gum | R. long | elongate |
| To come to | advĕnīre | P. R. advĕn | 3rd R. advent |
| Honour | hŏnor | G. honōris, m.g. | |
| Fir | ăbies | G. abietis | |
| Without knots | ēnŏdis | G. enodis | |
| Knotty | nŏdosus -sa -sum | R. nodos | |

(See also paragraphs 388 and 390.)

392. EXERCISE 49.

A.

1. Morbi (26) animi (45) perniciosiores sunt (38) et plures quam corporis (15). 2. Ego (35) sum miserior (28) quam tu (35) quæ (27) es (38) miserrima. 3. Epicuræos doctissimus (48) quisque (44) contemnit. 4. Gorgias celeberrimus Græcorum (44) sophistes, magna mercede conductus, artes suas (20) docebat (3). 5. Superiorum temporum (17) memoria optima vitæ (11) humanæ (21) magistra est. 6. Nihil (31) est (38) dulcius (29) veritatis (45) luce (27). 7. Melior tutiorque est certa (38) pax (9) quam sperata victoria (37). 8. Quinque (44) sensibus, sed (6) una (44) mente (40), res (13) dissimillimas comprehendimus ut colorem (14), saporem, odorem, calorem (18), et sonum. 9. Simiæ quæ (27) caudas non habent (7) hominis (5) figuræ simillimæ sunt. 10. In altissimis (20) montibus (20) aer siccior est et purior (45); ubi terræ (8) propior est humidior est et densior.

B.

1. No-one (17) of the Romans (20) was (38) more eloquent than Cicero (1). 2. The (18) snow never (28) lay less deep (20) (than) four (44) feet (44) (acc.). 3. I think death (8) lighter than disgrace (29). 4. A rare bird on the earth (8) (plu.), and very like a black (39) swan (dat.). 5. The love of (our) parents (11) is the sweetest (29) reward for (our) industry (gen.). 6. The pleasure of the mind (45) is greater than (that) of the body (15). 7. Rome and Naples are the largest cities (7) of Italy (20). 8. Nothing (31) in friendship (45) is more destructive than flattery. 9. In winter time (17) the days (18) are shorter and the nights (29) longer. 10. Very-old wines (7) are not always (33) the sweetest (29). 11. C. Marius being born (44) in a very humble station (Lat., 'locus') came-to the highest (20) honours of the state (14). 12. The lower part (1) of the fir, and nearest to the earth (8), is without-knots; the higher is harder (33) and knotty.

EXERCISE 50.

THE DATIVE WITH 'ESSE' AND THE COMPOUNDS OF 'SUM.'

393. Where we say 'I have' the Latins often said 'Est mihi'—that is, 'There is to me,' and similar expressions; so that the old rule used to be, 'Sum, when it implies possession, is followed by the dative of the person.'

394. The verb 'possum,' ('I am able') is a contraction for 'potis sum,' which first becomes 'pot-sum,' and the 't' is changed into 's.' From the perf. root 'potfu,' the 'f' is eliminated.

The verb is therefore thus declined :—

| INDICATIVE. | SUBJUNCTIVE |
|---|---|
| | *Present.* |
| Possum, potes, potest. | Possim, possis, possit. |
| Possumus, potestis, possunt. | Possimus, possitis, possint |
| | *Imperfect.* |
| Poteram, poteras, etc. | Possem, posses, posset. |
| | Possemus, possetis, possent. |

*Future.*

Potero, poteris, etc.

*Perfect.*

Potui, potuisti, etc. Potuerim, potueris, potuerit.

*Pluperfect.*

Potueram, potueras, etc. Potuissem, potuisses, etc.

*Future Perfect.*

Potuero, potueris, etc.

INFINITIVE.

*Present.* Posse. *Perfect.* Potuisse.

PARTICIPLE.

*Present.* Potens.

395. All other compounds of 'sum,' which are conjugated exactly like 'sum' (see Lesson 38), govern the dative.

396. Sometimes, instead of the dative, we find the preposition of the compound repeated, followed by its proper case, as 'In hac vita nihil inest nisi miseria,' 'In this life there is nothing but misery.'

397. Quisquis is thus doubly declined:—

*Singular.*

| | m. | f. | n. |
|---|---|---|---|
| N. | Quisquis | Quisquis | Quidquid, or quicquic |
| A. | Quemquam | | Quidquid, or quicquic |
| G. | | Not found. | |
| D. | | Not found. | |
| A. | Quoquo | Quaqua | Quoquo |

*Plural.*

| | | | |
|---|---|---|---|
| N. | Quiqui | Not found. | Not found. |
| A. | | Not found. | |
| G. | | Not found. | |
| D. Ab. | | Quibus-quibus | |

398. VOCABULARY 50.

| *English.* | *Latin.* | | | *English Deriv.* |
|---|---|---|---|---|
| Ring | annŭlus | G. annuli | | annular |
| About | circiter, an adv. | | | |
| Any one | quisquis (see par. 403) | | | |
| Happily | beātē, (adv., from beatus) | | | beatitude |
| To pass time | dĕgĕre | P. R. dĕg. | No 3rd R. | |
| Belonging to the Decemviri | Decemvirālis, adj. | | | |
| Tablet, or table (of law) | tăbŭla | G. tăbulæ | | tabulary |
| Brass | æs | G. æris, n.g. | | |
| To cut into | incīdo | P. R. incīd | 3rd R. | incīs |
| Public | publicus -ca -cum | R. public | | |
| To put up | prŏpōnĕre | P. R. prepŏsŭ | 3rd R. | proposit |
| Ear | auris | G. auris, f.g. | | auricular |
| To cherish | cŏlere | P. R. colu | 3rd R. | cult |
| To be in, or upon | inesse | P. R. infu | 3rd R. | infut |
| To be engaged in | interesse | P. R. interfu | 3rd R. | interfut |
| To survive | superesse | P. R. superfu | 3rd R. | superfut |
| To be harmful to | obesse | P. R. obfu | 3rd R. | obfut |
| To be able | possum | P. R. pŏtŭ | 3rd R. | none |
| To be at the head of | præesse | P. R. præfu | 3rd R. | præfut |
| To be wanting | deesse | P. R. dĕfu | 3rd R. | defut |
| To be absent from / To be away from | ăbesse | P. R. abfu | 3rd R. | abfut |
| To do good to | prōdesse | P. R. profu | 3rd R. | profut |
| Rude / Fierce | ferus -ra -rum | R. fer | | |
| To grow gentle | mītescĕre | No Perf. or 3rd Roots | | |
| Only | mŏdŏ, an adv. | | | |
| To lend | commŏdare | P. R. commodāv | 3rd R. | commodāt |
| Patient | pătiens | G. patientis | | |
| Syracuse | Syrăcūsæ | G. Syracusarum, no sing. | | |
| To hurt | nŏcĕre (dat.) | P. R. nocu | 3rd R. | nocit |
| Precept | præceptum | G. præcepti | | |
| Usefulness / Advantage | ūtilĭtas | G. utilitātis | | utility |
| So | sic, adv. | | | |
| To consider / To look | tuĕri, dep. | | 3rd R | tuit / tūt |
| Whosoever | quicunque, quæcunque, quodcunque —declined like qui (Lesson 27), with 'cunque' added. | | | |
| To do / To drive | ăgĕre | P. R. ēg | 3rd R. | act |
| To render an account | rĕferre | P. R. rĕtŭl | 3rd R. | relāt |
| Advantage | Pr. R. refer commŏdum | G. commodi | | accommodate |
| Likeness | similitūdo | G. similitudinis | | similitude |
| Although | etsi, a conj. | | | |
| Intellect | ingenium | G. ingĕnii | | ingenious |
| But | at. conj. | | | |
| Certainly | certe, an adv. | | | |
| Learning | doctrīna | G. doctrinæ | | doctrine |
| A collier | carbōnārius | G. carbonarii | | |
| Large | spătiō.us -sa -sum | R. spatios | | spacious |
| A fuller | fullo | G. fullōnis | | |
| To remove | commigrare | P. R. commigrāv | 3rd R. | commigrat |
| Partnership | sŏ iĕtas | G. societātis | | society |
| Glittering | nītidus -da -dum | R. nitid | | |
| Soot | fū ligo | G. fuliginis | | |
| Spot | măcŭla | G. maculæ | | immaculate |
| To befoul | inquīnāre | P. R. inquinav | 3rd R. | inquinat |
| To join together | conjungĕre | P. R. conjunx | 3rd R. | conjunct |
| Mellow | mītis | G. mitis | | |
| To cure | cūrare | P. R. curav | 3rd R. | curat |

399. EXERCISE 50.

A.

1. Non digitis (18) ullus (31) annulus inest. 2. Ex (26) eo (37) proelio (26) circiter millia (44) hominum (5) CXXX. superfuerunt. 3. Non potest quisquam beate degere, qui (27) se (35) tantum (19) intuetur (46). 4. Consules (17) leges (5) decemvirales, quibus (27) tabulis duodecim (44) est nomen, (20) in æs incisas in publico proposuerunt. 5. Qui (27) reipublicæ (45) præfuturi sunt, hoc (37) Platonis præceptum teneant (18) ut utilitatem civium (8) sic tueantur, ut quæcunque (acc. n. pl.) agant, ad eam (37) referant obliti (46) commodorum suorum. 6. Etsi ingenium nobis (35) non defuit, at certe doctrina defuit. 7. Non solum (45) interfuit his (37) rebus, (13) sed etiam præfuit. 8. Carbonarius qui (27) spatiosam habebat (7) domum (1) invitavit (14) fullonem ut ad se (35) commigraret. Ille (37) respondit (18): 'Quæ (30) nam (40) inter (42) nos (35) esse possit societas, quum (22) tu (35) vestes (46), quas (27) ego (35) nitidas reddidissem (29), fuligine et maculis inquinaturus esses?' Haec (37) fabula (44) docet (3) dissimilia (49) non debere (46) conjungi.

B.

1. I have (some) books (6). 2. I have a name (20), or my name is . 3. (My) husband (9) is always (33) absent-from me (35). 4. We have mellow apples (12). 5. Nothing (31) does-the sick (35) more (38) good than (48) to be cured by him by (39) whom (27) they wish (Lat., 'volunt') to be cured. 6. There is a fountain (12) at Syracuse whose (27) name (20) is Arethusa. 7. None (17) is so (46) rude that (6) he cannot grow gentle if (15) he only lend (sub.) a patient ear to (her) who would cherish (Lat., 'about to take care of') (him). 8. He is a good (20) man (18) who (27) does-good-to those whom (27) he can, but (38) hurts no one (17). 9. Man (5) has a likeness to (Lat., 'with,' 'cum') God (27). 10. It is neither (48) harmful nor (48) does good to me (35).

400. EXAMINATION QUESTIONS.

1. When do you translate 'his,' etc., by 'ejus,' and when by proper case of 'suus'? 2. When is 'that' to be translated by 'ut,' and when otherwise? 3. What is a substantive clause, and how do you test its being so? 4. If two persons have been mentioned, to which of them do 'hic' and 'ille' respectively refer? 5. What is an intensive pronoun? 6. What participles are wanting in Latin? 7. What do you understand by an ablative absolute? 8. Into what case is the similar construction in English put? 9. What tense is 'He was born'? 10. What is a partitive genitive? 11. Why is an infinitive mood so called? 12. What are impersonal verbs? 13. What is the real subject of an impersonal verb?

*(To be continued.)*

# Chemistry of the Non-Metallics.

BY EDWARD AVELING, D.Sc. LONDON.

[This series of articles, whilst dealing with the subjects required by the University of London for the Matriculation Examination and with those required at the Elementary Stage of the Inorganic Chemistry (Branch X.) Science and Art Department, is intended as a practical guide to the philosophical and systematic study of the non-metallics.]

## CHAPTER VII.—OXYGEN.

OXYGEN—ὀξυς (oxus)=sharp, γενναω (gennao)=I produce. It is present as an element in most acids.

SYMBOL. WEIGHT NUMBER. PREPARATIONS.

A. O.
B. 16.
C. FIRST PREPARATION—From mercury oxide.

1. Heat about ½ of an ounce of well-dried mercury oxide (the red oxide) in a test-tube, as in Fig. 21. Apply the

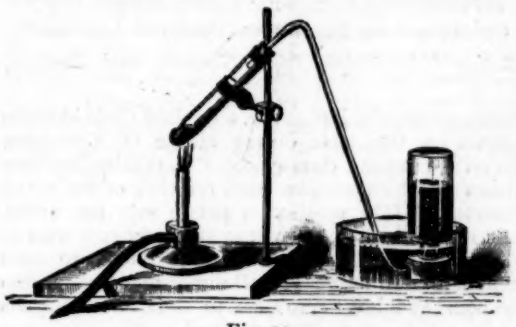


Fig. 21.

heat slowly, and so as to heat the lower part of the tube uniformly. The first bubbles that come off are air, and may be allowed to escape. Later, globules of mercury collect in the upper part of the tube, and a gas is given off and caught in the gas-jars in the pneumatic trough. The compound mercury oxide really breaks up into metallic mercury and oxygen gas. The mercury oxide can itself be formed by heating mercury in the air, and making the metal combine with the oxygen of the air.

2. $2HgO = 2Hg + O_2$.
3. 432 = 400 + 32.
2 vols.

### EXERCISES ON THE FORMATION OF OXYGEN FROM MERCURY OXIDE (*solved*).

Hitherto all our questions have dealt with cases where the temperature and pressure were normal, *i.e.*, the temperature was 0°, and the pressure 760 mm. The questions henceforward will, in many instances, be so planned as to involve calculations on the laws of Gay-Lussac and Boyle, as well as on the chemical equations.

67. What volume of oxygen is given off from 108 grams of mercury oxide when the temperature is 0° and the pressure 800 mm.?

432 grams HgO at 0° and under 760 mm. evolve 22·4 litres O.

1 gram " " " " evolves $\frac{22{\cdot}4}{432}$ " "

108 grams " " " " evolve $\frac{22{\cdot}4 \times 108}{432}$ litres O.

Under pressure 760 mm. vol. is $\frac{22{\cdot}4 \times 108}{432}$

" " 1 " " $\frac{22{\cdot}4 \times 108 \times 760}{432}$. (The vol. of a gas is increased as the pressure on it diminishes.)

Under pressure 800 mm. vol. is $\frac{22{\cdot}4 \times 108 \times 760}{432 \times 800} = 5\frac{1}{25}$ litres.

68. The barometer stands at 750 mm. What weight of mercury oxide is needed for the evolution of 500 cc. of oxygen, the temperature being normal?

Under pressure 750 the vol. required is 500 cc.

" " 1 " " " $\frac{500 \times 750}{}$

" " 760 " " " $\frac{500 \times 750}{760}$.

22,400 cc. O are evolved from 432 grams HgO.

1 " is " " $\frac{432}{22{,}400}$ " "

$\frac{500 \times 750}{760}$ are " " $\frac{432 \times 500 \times 750}{22{,}400 \times 760} = 0\frac{443}{1232}$ grams.

### EXAMPLES ON THE FORMATION OF OXYGEN FROM MERCURY OXIDE (*for solution*).

62. 1600 grams mercury oxide are heated. What volume of oxygen is given off? Temperature normal, pressure 784 mm. $80\frac{392}{784}$ litres.

63. On heating some mercury oxide, when the pressure is 745 mm., it is found that 50 grams of mercury are set free. What volume of oxygen was given off? ..... $2\frac{233}{745}$ litres.

64. 700 cc. of oxygen are furnished by heating mercury oxide. What weight of the oxide is decomposed? Barometer stands at 770 mm. ..... $13\frac{341}{385}$ grams.

SECOND PREPARATION.—From potassium chlorate.

1. Place in a strong flask previously coated with clay, or in a retort, some powdered potassium chlorate. Apply heat steadily. Catch the gas that comes off over water or by displacement of air, holding the gas-jar in the latter case mouth upwards. It is found better in practice to mix with the potassium chlorate some manganese dioxide (black oxide of manganese). The gas comes off then at a lower temperature than if the oxide is not present. The manganese dioxide is not, however, altered. Potassium chloride is left in the flask or retort. The difference between this salt and potassium chlorate, from which it is formed, can be shown by making a solution of the one salt and a solution of the other, and adding to each solution a few drops of a solution of silver nitrate. When the silver nitrate is added to the solution of potassium chlorate no precipitate is seen, as the silver chlorate that is formed is dissolved in the water. When the silver nitrate is added to the solution of potassium chloride a white precipitate is formed of insoluble silver chloride.

$KClO_3 + AgNO_3 = KNO_3 + AgClO_3$ (soluble)
$122\frac{1}{2} + 170 = 101 + 191\frac{1}{2}$
$KCl + AgNO^3 = KNO_3 + AgCl$ (insoluble)
$74\frac{1}{2} + 170 = 101 + 143\frac{1}{2}$
2 and 3. $2KClO_3 = 2KCl + 3O^2$
$245 = 149 + 96$.
6 vols.

### EXERCISES ON THE FORMATION OF OXYGEN FROM POTASSIUM CHLORATE (*solved*).

69. Required 2,000 cc. oxygen at a temperature of 10°, pressure normal. What weight of potassium chlorate must be taken?

273 cc. O at 0° become 283 cc. at 10°
283 " 10° " 273 " 0°
1 " " becomes $\frac{273}{283}$ " "
2000 " " become $\frac{273 \times 2000}{283}$ "

$6 \times 11{\cdot}2$ litres = 67·2 litres = 67200 cc. O evolved by 245 grams $KClO^3$,

1 " " " $\frac{245}{67200}$ "

$\frac{273 \times 2000}{283}$ " " $\frac{245 \times 273 \times 2000}{67200 \times 283}$ "

$= 7\frac{1}{11}$ grams.

70. Temperature 15°. Pressure normal. 350 grams potassium chlorate are heated. Find the volume of oxygen given off.

245 grams $KClO_3$ yield 67·2 litres O.
1 gram " yields $\frac{67{\cdot}2}{245}$ "
350 grams " yield $\frac{67{\cdot}2 \times 350}{245}$ "
273 vols. at 0° become at 15°, 288
1 vol. " becomes " $\frac{288}{273}$
$\frac{67{\cdot}2 \times 350}{245}$ " become " $\frac{288 \times 67{\cdot}2 \times 350}{273 \times 245}$
$= 101\frac{11}{91}$ litres.

EXAMPLES ON THE FORMATION OF OXYGEN FROM POTASSIUM CHLORATE (*for solution*).

65. Required 500 litres oxygen at a temperature of 13°. What weight of potassium chlorate is necessary? .....1736½ grams.

66. It is found on heating some potassium chlorate, that 298 grams potassium chloride are left. What was the weight of the oxygen evolved and its volume, the temperature being 26°? 192 grams, 147·2 litres.

THIRD PREPARATION.—From manganese dioxide.

1. Place in an iron bottle, fitted with a delivery tube, Fig. 22, a quantity of the black oxide of manganese, and

Fig. 22.

heat in the gas furnace; oxygen is given off, and two lower oxides of manganese are left behind, the monoxide and the sesqui-oxide (see next chapter).

2. $3MnO^2 = MnO + Mn^2O^3 + O^2$

3. 261 = 71 + 158 + 32.

2 vols.

EXERCISE ON THE FORMATION OF MANGANESE DIOXIDE (*solved*).

71. If 44,800 cc. of oxygen are required, the pressure being one-half the usual atmospheric pressure, what weight of manganese dioxide must be taken?

Under pressure ½, vol. = 44,800

" " 1, vol. = $\frac{44800}{2}$.

22,400 cc. O are formed from 261 grams $MnO^2$

1 " is " $\frac{261}{22400}$ " "

$\frac{44800}{2}$ " are " $\frac{261 \times 44800}{22400 \times 2} = 261$ grams.

EXAMPLE ON THE FORMATION OF MANGANESE DIOXIDE (*for solution*).

67. 1,305 grams of manganese dioxide are heated. Find the weight of manganese monoxide left, and the vol. of oxygen evolved at a temperature of −13° ..... 355 grams, 106⅔ litres.

FOURTH PREPARATION.—From water.

See the electrolysis of water as described on page 334, Vol. IV.

FIFTH PREPARATION.—From potassium nitrate.

1. Heat common nitre (potassium nitrate) in a strong vessel. The salt decomposes into potassium nitrite and oxygen.

2. $2KNO^3 = 2KNO^2 + O^2$

3. 202 = 170 + 32.

2 vols.

We are now in a position to understand another principle in chemical nomenclature.

Every compound has a double name. The second part of that name ends in 'ide,' when only one kind of element is present in the chlorous radical, or the electro-negative part of the compound. But when in that part *two* elements occur, one of which is almost always oxygen, the termination 'ite' or 'ate' is used. 'Ite' is used for the compounds containing a smaller quantity of oxygen: 'ate' for those containing a larger quantity. Some examples will make this clear:—

| | |
|---|---|
| HCl ... ... ... ... | Hydrogen chloride. |
| $H^2O$ ... ... ... ... | " oxide. |
| $KNO^2$ ... ... ... ... | Potassium nitrite. |
| $KNO^3$ ... ... ... ... | " nitrate. |
| KCl ... ... ... ... | " chloride. |
| $KClO^2$ ... ... ... ... | " chlorite. |
| $KClO^3$ ... ... ... ... | " chlorate. |
| $H^2S$ ... ... ... ... | Hydrogen sulphide. |
| $H^2SO^3$ ... ... ... ... | " sulphite. |
| $H^2SO^4$ ... ... ... ... | " sulphate. |

(*To be continued.*)

# How to Teach Drawing in Elementary Schools.

BY T. R. ABLETT,

*Superintendent of Drawing to the School Board for London.*

GEOMETRIC OR TECHNICAL DRAWING (*continued*).

*Section III.—Simple Plane Geometry and Drawing to Scale.*

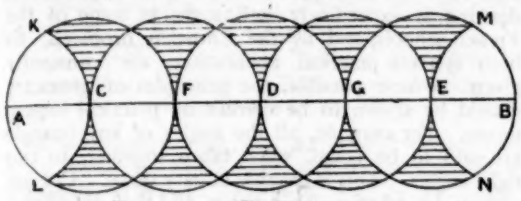
SINCE writing the last article, a Revised Code has been placed on the table of the House of Commons. Drawing is to be a class subject. A syllabus has been drawn up which provides work for each of the seven Standards. The syllabus is put in very few words, and it is, therefore, difficult to gather from it what is the exact nature of the work apportioned to each Standard. In future I shall divide my remarks into sections, and leave it to time to show for what parts of the syllabus they are most fitted.

1. *The use of the compass.*—The use of the ruler and of the set-square has been taught already. The compass completes the set of instruments absolutely needed in geometrical drawing. A compass for a child's use should be as simple and strong as it can be made, consistent with lightness. A plain screw, which can be tightened by an ordinary screw-driver, should unite the two legs. That the steel point may not be easily bent out of shape, it should be made stout almost to the end. The compass pencil should be held by a steel spring sheath which will grip it tightly, and no screw, which will, sooner or later, be sure to be lost or destroyed, is needed. Teachers will be saved much vexation, and the class great loss of time, if the above matters are attended to in obtaining instruments. A good disciplinarian instinctively foresees and eliminates all the causes of friction between himself and the pupils which he possibly can.

The teacher, holding a large compass, should demonstrate on the blackboard the way in which it is used. With respect to the position of the hand, it should be pointed out that the thumb should be placed on one side and two fingers on the other of the cylinder where the legs meet. No pressure must be put on the legs, or the distance between them will be diminished. Children constantly lose their measurements or distances in this way, if not warned. When the body of the class can hold the compass properly, the teacher should show how the steel point may be kept firmly in one place whilst the pencil is revolved. A little drill in revolving the compass, without allowing the pencil to touch the paper, will be useful. Lastly, the pupils may be allowed to describe some large circles. Notwithstanding a rapid consumption of paper, it is advisable to allow first exercises to be

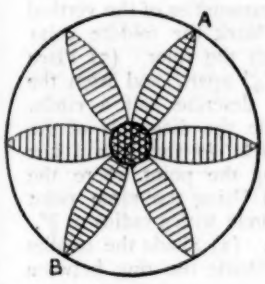
worked on a large scale, as accuracy is more attainable than in working on a small scale

As success in geometric drawing depends a good deal upon the amount of skill, which is developed in the use of a compass, a number of interesting exercises should be given in the form of patterns.

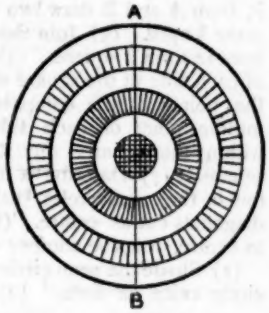



Ex. 1.

Exercise 1 should be worked on a large scale upon the blackboard. The teacher should work it bit by bit before the class, and the pupils should follow step by step. Draw AB six inches long (teacher uses half-a-foot for an inch), and mark the inch divisions. From the middle point D describe a circle 1″ in radius. Describe circles of the same size from points C and E. From F and G describe similar circles. From centre A describe KCL, and from B arc MEN. Shade the spaces to make a pattern.




Ex. 2.



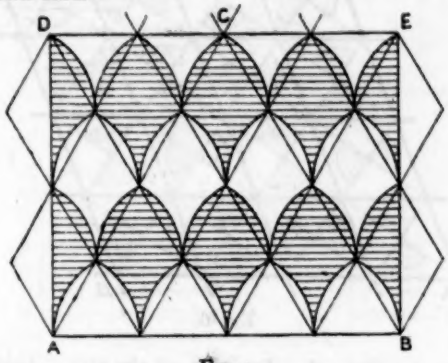

Ex. 3.

In Exercise 2 the circle is to be 1½″ in radius, though the teacher should make it 1½′ on the blackboard. Draw the diameter AB, and with the radius divide the circumference into six parts. These points are the centres from which to describe the arcs forming the petals of the flower. The small circle in the centre is ¼″ in radius. Shade.

In Exercise 3 describe the circle as before. Draw diameter AB. Mark ¼″ divisions on radius. Describe the inner circles, beginning with the largest.

Having gained skill in describing a circle, and in striking an arc, the pupil will be able to draw an equilateral triangle and a hexagon, and, with the lengths of the sides and diagonals given where necessary, an isosceles triangle, a scalene triangle, a rhombus, a rhomboid, a trapezium, and an irregular polygon.

These names, and others of like kind, should be defined and taught as they are required. It is not to be supposed that because all the definitions are put at the beginning of books on geometry they are all to be learnt at once. To induce young pupils to take such pains in manipulation as accuracy requires, it is necessary to interest them by making geometric drawing attractive. The following exercises will be found useful in this respect, since they illustrate some of the methods by which geometric design is produced. In executing them, careless work will cause the pupil so much additional trouble, and produce such unsatisfactory results, that it will be found to bring about its own cure.

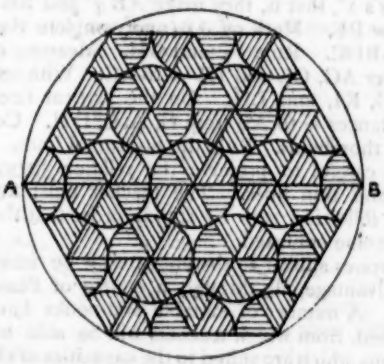



Ex. 4.

In Exercise 4 the teacher will represent AB as 2′, and instruct the pupil to draw to a scale of 2″ to 1′ in his drawing. Draw the equilateral triangle ABC. Divide each side into four equal parts with the ruler. Rule the diagonal lines, producing them beyond the triangle to the right and left. Draw AD and BE with the set square. Join DE. Complete the requisite number of diamond shapes. Strike the arcs to make the pattern. Shade.

The more careful boys, for home-work, may be allowed to colour the pattern with flat washes, as in mapping. Colour has great attractions for young people, and its use should be allowed as a reward. It is well to mention that colouring with flat washes is used by machine draughtsmen to distinguish the different metals and materials used, and thus it makes their intricate network of lines, simple reading. In architectural drawing and in the diagrams of science, colouring is of similar value.

In Exercise 5 the teacher draws AB 2′, and the pupils use a scale of 3″ to the teacher's 1′. Describe the circle. Divide the circumference into six parts

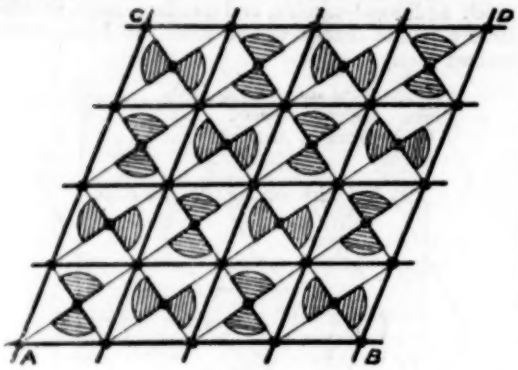



Ex. 5.

with the radius. Draw the hexagon. Draw all its diameters. With the ruler divide each side into two equal parts. Rule the lines, marking out the equilateral triangles. Describe the circles. Shade or colour.

In Exercise 6 the teacher draws CB 2½′, and AB, AC 2′ each. The pupils use a scale of 1½″ to the teacher's 1′. Draw the rhombus ABDC, beginning

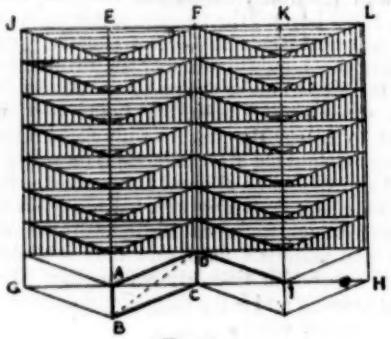
with CB. With the ruler divide each side into four equal parts. Rule the lines parallel to the sides.




Ex. 6.

Rule the diagonals. Describe all the arcs. Thicken the radii. Mark the dots at the angles of each rhombus and at the centre of each circle. Shade or colour.

In Exercise 7 the short side, long side, and diagonal of the figure ABCD are to one another as 3, 8, 10. The teacher draws AB as 3 inches, that is, 2′ 3″




Ex. 7.

for BE. The pupils draw to a scale of $\frac{1}{4}$″ to the teacher's 1″, that is, they make AB $\frac{3}{4}$″ and BE 6$\frac{3}{4}$″.

Draw BE. Mark off AB, and complete the rhomboid ABDC. Rule FC and GH. Measure off with the ruler AG, CI, and IH = to AC. With set square rule JG, KI, and LH. On the vertical lines mark off distances = to AB from G, A, C, I, H. Complete all the rhomboids. Rule the horizontal lines. Shade, and be careful to preserve the relation between the thick and thin lines. The teacher must keep the pupils following step by step in order that they may not become confused.

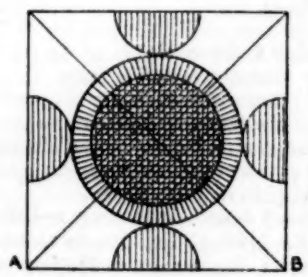
Exercises similar to the above may be introduced, with advantage, all through a course of Plane Geometry. A number of suitable text-books have been published, from which teachers will be able to select problems which are suited to the capacities of children, and which are likely to be required in machine drawing, building construction, and pattern drawing. Perhaps the most well-known authors or publishers are Angel, Bain, Binns, Bradley, Burchett, Carroll, Cassell, Clarke, Gilbert, Gill, Kennedy, Rawle, Smith, Winter. Bradley's work is the most exhaustive and expensive. Angel and Binns deal chiefly with Solid Geometry, or Projection. Carroll has arranged the work in a logical and easily assimilated form. Rawle's is a very useful book. Winter deals with the geometry required by military students.

It is a mistake to put children through a long course in working problems, like that of the Second Grade, without showing some practical applications after each new set of problems is taught. Geometrical drawing is exceedingly well-taught in some of the French schools, and by the Christian Brothers. In both systems practical applications are constantly given. Where possible, the principles of geometry should be shown to be correct by practical experiments. For example, all the angles of any triangle are said to be equal, when taken together, to two right angles. This is capable of easy proof. Cut out various-shaped triangles in paper, and then cut off and put together the angles of each one in order to make one angle equal to two right angles.

2. *Dictated Drawing.* This sharpens the intelligence, by accustoming the pupils to work from verbal directions or orders; it necessitates the use of a precise nomenclature between teacher and pupil; it forms a good examination test, and is an effective method of teaching drawing to a large class. The following exercise may serve as an example. The pupils must not be shown the drawing until they have completed their attempt from dictation.

(1) Draw a horizontal line AB 1$\frac{1}{2}$″ long. (2) Above it, from A and B draw two vertical lines, each of the same length. (3) Join the extremities of the vertical lines to form a square. (4) Mark the middle point of each side of the square with the ruler. (5) Place the points of the compass $\frac{1}{4}$″ apart, and from the middle point of each side describe half a circle, within the square. (6) Rule the diagonals of the square. (7) Describe a circle so that it will just touch the semi-circles, using the point where the diagonals cut as centre. (8) Using the same point as centre, describe another circle with a radius of $\frac{3}{8}$″.

(1) Shade the semi-circles. (2) Shade the smaller circle twice as dark. (3) Shade the ring between




Ex. 8.

the circumferences of the larger and smaller circle with lines running towards the centre.

Dictated Exercises of varying difficulty may be made out to suit the work of any particular class.

The teaching of Simple Solid Geometry will be considered in the next article.

*(To be continued.)*

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## Recent Inspection Questions.

[*The Editor respectfully solicits contributions—all of which will be regarded as* STRICTLY PRIVATE—*to this column. For obvious reasons, it cannot be stated in which district the questions have been set.*]

### STANDARD I.

89 407
407 98
63
980 1087
9 908

*Dictation.*

Words: World, white, frame, globe, school, blackboard, length, feet, yard, drawn.

### STANDARD II.

*Arithmetic.*

(*Card A.*)

75,057
8,059

5,869 × 756
83,069 ÷ 8
85,674 × 89

(*Card B.*)

70,007
895

6,874 × 869
75,069 ÷ 9
58,679 × 98

*Dictation.*

2nd Series, 'Royal Readers,' page 117, No. 4. 'Sometimes...enemy.'

### STANDARD III.

*Arithmetic.*

(*Card A.*)

(1) 84,684 ÷ 684.

(2) £98 17s. 7d. + £38 14s. 6½d. + £19 17s. 9¾d. + £14 8s. 8d. (words).

(3) From £395 14s. 6d. take £249 16s. 7½d.

(4) What shall I receive out of £5 after deducting from it 14s. 6d. and then paying for the receipt stamp?

(*Card B.*)

(1) 4,064 × 608.

(2) Take £48 16s. 9¾d. from £84 19s. 10½d.

(3) Add (in words)—

| £ | s. | d. |
|---|---|---|
| 810 | 17 | 8¼ |
| 70,809 | 16 | 10¾ |
| 6,030 | 10 | 0¼ |
| 106,846 | 15 | 2½ |

(4) What is left after subtracting £684 8s. 3¾d. from £1,560 10s. 2½d.?

*Dictation.*

2nd Series, 'Royal Readers,' page 59, No. 9 to 'wrong.'

*Grammar.*

Write six nouns and six verbs, and form sentences with each; pick out adv., adj., and per. pro. from the dictation.

### STANDARD IV.

*Arithmetic.*

(*Card A.*)

(1) If a man gets £327 10s. 7½d. per year, what that daily?

(2) Reduce 5,005,365 inches to miles.

(3) Reduce 605,742 ounces to tons.

(4) If £3,784 10s. 7½d. is divided among 3 men, and the first gets 15 guineas more than the others, find each man's share.

(*Card B.*)

(1) Bring 5 miles, 19 poles, 5 yards, 1 foot, 3 inches to inches.

(2) £9,067 9s. 8½d. ÷ 109.

(3) What would be the sum to pay 7 companies for a fortnight if each has 95 men who earn 10½d. a day?

(4) Bring 36 acres to inches.

*Dictation.*

2nd Series, 'Royal Readers,' page 117, No. 4 to 'dish.'

*Grammar.*

(*Card A.*)

(1) Parse: The minister presented a memorial against it.

(2) Write six transitive and six intransitive verbs.

(3) What is a proper and what is a common noun?

(*Card B.*)

(1) Parse: The ship was visible occasionally during the storm.

(2) What is a conjunction? Give examples.

(3) Write five sentences having personal pronouns.

STANDARD V.

*Arithmetic.*

(*Card A.*)

(1) Bill: 7,500 at 17s. 6d. per 1000.
696 tiles at 1s. 3d. doz.
17 men 29 days each at 5s. 9d. day.
13 „ 29 „ „ at 3s. 3d. „
66 loads at 2s. 3d. load.

(2) 214 cwts. 1 qr. 6 lbs. at £9 11s. 2d. per cwt.

(3) Find the value of 20 sheep if 157 are sold for £222 2s. 2d.

(4) $\frac{3}{5}+\frac{7}{8}+\frac{5}{6}$ and $\frac{7}{8}-\frac{5}{9}$.

(*Card B.*)

(1) Bill: 6 doz. sherry at 30s. doz.
5½ „ port at 31s. 6d. doz.
10 „ claret at 12s. 8d. „
2 gals. brandy at 1s. 9d. quart.

(2) 3,079 at 17s. 10½d. each.

(3) Gave 19s. 4d. for 8 bush. coals; how many bushels can be bought for £11 12s. 0d.?

(4) $\frac{5}{3}+\frac{5}{6}+\frac{3}{8}$; subtract $\frac{7}{8}$ from the result.

*Grammar.*

(*Card A.*)

(1) Analyse and parse: 'His mother's last words came to his mind.'

(2) Form adjectives from—Poet, burden, national, wheat, gentleman.

(3) Write six adjectives formed from nouns.

(*Card B.*)

(1) Parse and analyse: 'A bridge was thrown over the river by Cæsar.'

(2) Form nouns from—Chariot, deed, perfect, good, govern.

(3) Form six adjectives from verbs.

STANDARD VI.

*Arithmetic.*

(*Card A.*)

(1) $\frac{9\frac{1}{2}\div 3\frac{3}{10}}{6\frac{3}{4}\times 3\frac{1}{3}}$

(2) Find the value of £·525+8·425 of ¾+·3 of 5s.

(3) If a 4d. loaf weighs 2 lbs. 3 oz. when wheat is 7s. 1½d. per bushel, what should it weigh when wheat is 7s. 11d. per bushel?

(4) Simple interest on £3,450 12s. 7d. for 8½ years, at 4$\frac{5}{8}$ per cent.

(*Card B.*)

(1) Reduce 7 lbs. 8 oz. to the fraction of 18 lbs.

(2) Divide the sum of 5·005 and 2·605 by their difference.

(3) A man has £576 6s. 8d. after paying 5d. in the £ for taxes. What is his income?

(4) Interest on £675 6s. 8d. at 4½ per cent. for 4½ years.

*Grammar.*

(*Card A.*)

(1) Analyse, and parse the subordinate sentence: 'He scarce had ceased when the superior fiend was moving towards the shore.'

(2) Give three words with meanings from *pre*, *ob*, *trans*.

(3) Write prefix and meanings of antecedent, interdict, surface, irresistible, exclude.

(*Card B.*)

(1) Parse the subordinate sentence; analyse whole: 'His answers showed that he had not studied the subject.'

(2) Form words from prefixes ex, ab, retro, sub, oc, ultra.

(3) Give the meanings of per, trans, ultra, ob, abs.

*Composition.*

On ships, fish, fishing, or gardening.

—o—

## Science Notes.

SUBSTITUTES FOR BOX-WOOD.—Owing to the enormous development during late years of illustrated literature, and the consequent increase of consumption of box-wood in the preparation of the necessary wood-blocks, the supply of that material is by no means equal to the demand, and the attention of many interested in the hard-wood trade is now being directed to the discovery of suitable substitutes to compensate for the gradual diminution in the supplies of this useful wood. An essay recently written by Mr. J. R. Jackson, of Kew, deals very thoroughly with the question. So far back as 1875 a real uneasiness began to be felt as to the future supplies of box. Many of the box-wood forests in Asia Minor were then exhausted, and the depletion was so marked throughout the whole country, that it attracted the attention even of the Turkish Government, and the further cutting of box-wood was prohibited in the crown forests. According to a report from the British consul at Tiflis in 1879, *bonâ fide* Caucasian box-wood was at that time commercially non-existent, almost every marketable tree having been exported. Mr. Jackson draws attention to the capabilities of certain Indian woods for engraving purposes, and also to an invention by Mr. E. Badoureau for forming a sort of artificial box-wood. This invention presumably consists of subjecting some soft wood to heavy pressure, thereby solidifying and hardening it; and it is stated that wood so treated lends itself very favourably to engravers' work.

* * * * *

INDIA RUBBER.—From accounts given by Consul Andrews, of Rio de Janeiro, which have recently appeared in the *Journal of the Society of Arts*, we learn that the rubber industry is paramount in the provinces of Pará and Amazon, in Brazil, and that india-rubber now ranks third in the list of natural exports from that country. The milky sap which constitutes the rubber is obtained from trees growing wild in the forests, which trees thrive best in low-lying river valleys annually submerged to a depth of three or four feet. The system employed by

the sap-collectors is most wasteful and exhaustive, and there seems little doubt that if a more rational and careful plan had been pursued during the last half century, a gain to the country would have resulted of some millions of trees, which have now been lost through excessive and premature tapping. As soon as the dry season sets in the collectors' work begins. Living in a small leaf-thatched hut in the midst of the forest, these men quickly hunt out every tree in the neighbourhood, and map out regular rounds for themselves. They cut small holes in the bark, and suspend little clay cups beneath the gashes to catch the exuding sap. After having completed his round and worked back to his starting-point, each collector starts out afresh with a large earthen vessel. Into this he pours the rubber from the little cups, and on reaching the hut again empties it into a large turtle shell. Next comes the coagulating or hardening process. This is done by pouring some of the sap on a wooden shovel and exposing it to the smoke of palm nuts. This process is repeated several times, until the shovel is coated with a layer of rubber of considerable thickness. The layer is then cut on one side so as to enable it to be slipped off the shovel and hung out in the sun to dry. During this process the rubber changes from milky white to gray, then to yellow, and finally to a dark brown. The trade in india-rubber has much increased of late years. The value of the article exported from the two ports of Pará and Manaos during the five years, 1839-1844, was but £79,000; while in the single year 1882 it reached a total of no less than £3,000,000.

* * * * *

PRESERVATION OF TIMBER.—Some five years ago an American chemist, being desirous of rendering wooden boards impervious to fire and to decay, hit upon the plan of boiling the shingles in a solution containing 10lbs. salt and 20lbs. of lime to 250 gallons of water, until they were thoroughly saturated with lime and salt. Trials since made of these prepared boards have proved satisfactory in every way. Ordinary unprepared shingles when dipped into naphtha and lighted were entirely consumed, but those which had been subjected to the above-mentioned boiling process were only slightly charred. The preservative effects of the process against the effects of wind and weather are said to be equally striking, and it is considered that if the process be applied to wood in its green state, when the sap cells are still open and the wood altogether more permeable to the preservative ingredients, their action will be still more active and thorough. In the United States, where wood figures so largely as a constructive material for dwellings, and the risks from fire are correspondingly great, the value of this preservative process can hardly be over-estimated.

* * * * *

SLAMMING OF DOORS.—Most people will regard any invention calculated to effectually put a stop to this nuisance as an unmixed blessing. A contrivance recently shown at the Building Trades Exhibition seems to be thoroughly effective. It may roughly be described as a small cylinder, filled with oil, with a piston—the rod of which is hinged to the door—working up and down within it. In this piston is a valve opening only in one direction. A little consideration will make it clear that when the piston is pressed in one direction the oil streams through the valve and offers no resistance, while on the other hand, when the piston is pressed in the contrary direction the valve closes, the oil is compressed and the free movement of the piston impeded. If now there be a small orifice through which the oil can escape, the pressure of the piston will force the oil through this orifice, and the piston will gradually work its way to the end of the cylinder, the time occupied in so doing being dependent of course on the size of the hole through which the oil can escape. In other words, by regulating the size of this orifice, the time spent in completing the movement of the piston can be varied to any extent. By a clever arrangement of springs and valves the door can be made to close rapidly until within two or three inches of its final position, then pause for an instant as the piston is brought to a standstill by the buffer-like action of the compressed oil, and finally complete the act of closing firmly, gently, and noiselessly, to all appearances indeed, as if it was being closed from the other side by some one who was taking the most elaborate pains to shut the door quickly and yet to avoid all noise.

* * * * *

EARTHQUAKE AREAS.—An important point in connection with recent seismic investigation in Japan is stated in *Nature* to have been recently noticed. One place may appear more subject to shocks than another place which may be near at hand, and to be more violently affected than the latter by an earthquake which visits both. Thus, with similar instrument, placed at the corners of a triangle having sides about 800 feet long, an observer obtained conclusive evidence that, while at one corner there might be sufficient motion to shatter a building, at the other corners the disturbance might be trivial. In the last severe shock by which the capital of Japan was visited, the chimneys of the British Legation were shaken so severely that they had to be rebuilt, but the Russian Legation, a building of much the same character a mile away suffered no appreciable damage.

—o—

## Lectures on Shakspere's 'Tempest.'

BY H. MARMADUKE HEWITT, M.A., LL.M.,
*Late Assistant-Examiner in the University of London.*

### ACT II., SC. 1 LINES 1—289.

(The figures in brackets refer to the pages of the Clarendon Press Edition.)

IN the Second Act the other survivors of the ship wreck are discussing their position. The group comprises King Alonzo and his brother Sebastian, the old courtier Gonzalo, and some others. Gonzalo, who wishes to look at the bright side of the picture, says (21), '*Our escape is much beyond our loss.*' In what sense is it beyond it? Most likely the sense is 'The fact that we have saved our lives is much more important than the loss of our property.' By '*This visitor will not give him over so*' is meant that Gonzalo (here called 'the visitor') will not desist from his well-meant attempts at consolation. '*Where every grief is entertained that's offered*' means 'Where a man lays himself open to (or broods over) every misfortune that befals him'; with such a disposition he will never lack trouble. The passage beginning, '*Which, of he or Adrian, for a good wager, first begins to crow?*' is a little obscure. Who is Adrian? His name appears in the list of characters at the beginning of the scene. Antonio lays a wager with Sebastian that Adrian would

crow before Gonzalo (*i.e.*, speak first), and the wager was a laugh. Adrian speaks first; so Antonio is the winner. Sebastian laughs at what Adrian has said, and Antonio acknowledges that by his laughter he has paid the bet. The wit of the passage is far from brilliant. In '*at which end of the beam should bow*' (24) the student must notice that *should* is a contraction for 'she would.' The princess was uncertain which course to adopt; in the language of metaphor, she 'weighed' the two opposite courses. '*I would not adventure my discretion*' (26) means 'I would not endanger my character for discretion.' '*Do not omit the heavy offer of it*' (26) is peculiar. They are talking about the inclination to sleep. The *heavy offer* is the offer which brings heaviness or drowsiness. For the sentiment that 'sleep is a comforter' compare Macbeth, Act II., Sc. 2:—

> 'Sleep that knits up the ravelled sleave of care,
> The death of each day's life, sore labour's bath,
> Balm of hurt minds, great Nature's second course,
> Chief nourisher in life's feast.'

There is a long passage (p. 27), beginning, '*If you but knew*,' that requires some elucidation. A line or two before, Sebastian introduces the simile of water. It is taken up by Antonio, who says that he will teach his stagnant water to flow. 'It has already learned to ebb,' replies Sebastian. Antonio replies, 'O, if you but knew how much even that metaphor which you use in jest encourages you to the design I hint at; how, in stripping the words of their common meaning and using them figuratively, you adapt them to your own situation!' '*Eye and cheek proclaim a matter from thee*' may be paraphrased by 'The expression of your eye and of your countenance indicate that you are about to say something.' '*Only professes to persuade*' (27) is explained by Mr. Wright as 'persuasion is his only profession'—that is to say, he believes the verb *profess* has the same meaning here as when we say of a man who offers to teach a language or an accomplishment that he *professes* it. The earlier commentators took the passage to mean, 'But he only pretends a wish to persuade the king,' *i.e.*, 'He doesn't believe what he says himself.' '*What to come* (*is*) *in your and my discharge*' (28) = 'The future is for you and me to perform or carry into execution.' The statement with regard to the twenty consciences, '*Candied be they and melt ere they molest*,' is susceptible of two interpretations. Let us first settle that *candied* means 'congealed,' and that the two words *candied* and *melt* are contrasted. Then the passage means 'They must be first congealed, and then dissolve (undergo all sorts of modifications), before they prevent me from carrying out my purpose.' But some commentators wish to substitute *or melt* for *and melt*. Then the sense would be, 'They might be hot or cold, they should not give me the smallest trouble.' A little further on, '*put to the perpetual wink for ever*' appears as the poetical equivalent of 'put to death.'

There are three passages in which the name of some part of the human body is introduced in an unusual or figurative sense. These expressions are '*an eye of green*,' (22), '*the stomach of my sense*' (23), and '*sensible and nimble lungs*' (25). The exact meaning of *eye* is here 'a small portion.' We should probably say, 'a shade of green.' In the second passage, *sense* has been variously interpreted as *feeling*, *reason*, and *affection*. 'To be contrary to the stomach of' is a metaphorical expression, which means much the same as 'give offence to.' 'These observations,' Alonzo remarks, 'are painful to my feelings.' The expression, '*of such sensible and nimble lungs*' is admirably explained in the notes to the Clarendon Press Edition. To have sensitive lungs means to be easily moved to laughter. The student will recollect how common was the error that led people to refer the different mental feelings to various parts of the human body.

Of the metaphorical expressions which occur in this portion of the play, we may notice as among the most striking, '*You rub the sore when you should bring the plaster*' (24), of which the literal meaning is, 'You intensify my regret instead of offering consolation.'

That '*ebbing men*' should denote the unfortunate, or those whose fortunes are on the wane (here, again, we have slid unconsciously into a metaphor, nor should we have avoided it by using the word *declining*, or by saying '*men who are losing ground*'), will surprise no one who recollects Shakspere's famous lines:—

> 'There is a tide in the affairs of men
> Which, taken at the flood, leads on to fortune;
> Omitted, all the voyage of their life
> Is bound in shallows and in miseries.'

What is the meaning of the assertion, '*They will tell the clock to any business that we say befits the hour*' (29)? The context seems to require the meaning of 'assent to' or 'take part in'; but it is not easy to connect this idea with counting the strokes of the clock.

Substantives or nouns which deserve comment are the following: *hint*, *merchant*, *porridge*, *temperance*, *paragon*, *rate*, *loathness*, *plantation*, *tilth*, *felony*, *engine*, *foison*, *wink*, *note*, *chough*, *kibe*, and *suggestion*. Of some of these we shall give the etymology. The meaning of others seems to be determined by the context.

In '*our hint of woe*' (20), Mr. Wright tells us that *hint* means theme or subject. *Woe* must, therefore, mean 'lamentation.' Dr. Johnson wishes to explain *hint* as 'cause,' because a hint is that which recalls something to the memory. The word *hint* signifies originally 'a thing taken,' being a contraction of *hinted*, or rather a variant of the old past participle *hent*, with the same sense. The word *merchant* means a 'merchant vessel' in '*the masters of some merchant*' (21), and *the masters* are probably the owners. Our familiar *porridge* must have meant originally a soup or broth made of leeks, if the derivation from the Latin *porrum* can be sustained. The suffix *idge* (*age*) is clearly due, Mr. Skeat thinks, to confusion with *pottage*. *Temperance* means 'temperature' in Adrian's description of the island (21). In the next line temperance is spoken of as '*a delicate wench*.' We must recollect the Puritanical custom of naming children from the titles of certain virtues.

In the expression '*in my rate*,' the meaning of *rate* is 'estimation.' We have already met with the word in the First Act of this play. *Loathness* (24) is a rather curious form of 'loathing.' When Gonzalo wishes (24) that he had the *plantation* of the island, he means the task of colonising it. Colonies were called 'plantations' in Elizabethan English. *Tilth* (25) is for 'tillage.' *Felony*, according to Mr. Skeat, is of Celtic origin, being derived from a verb which exists in Irish and Gaelic, and means 'to betray.' If this be correct, there is no truth in the derivation which

makes it 'the price of an estate or fee.' Legal writers have represented that a felony was originally a crime which entailed the loss of the offender's land. In other words, 'it was as much as his estate was worth' to commit such and such an offence. By *engine* is meant the horrible instrument of torture called the rack, one of the most diabolical of existing monuments of 'man's inhumanity to man.' *Foison* = 'plenty,' is from *fusionem*. The student will, of course, have noticed that when a French word has been derived from the Latin, it is taken from the accusative case, and not from the nominative. *Wink*, in the expression '*a wink beyond*' (28), has much the same meaning as *eye* in '*an eye of green*'; 'Ambition cannot penetrate the least bit beyond.' '*Can have no note*' (28) means 'can have no notification.' In representing the distance between Naples and Tunis as being so very great, Shakspere, no doubt, displays great ignorance of geography. Other instances are easily collected. *Chough* is, no doubt, connected with the verb *caw*. It belongs to the class of imitative words. *Kibe* (29), meaning a chilblain, is much the same word, etymologically, as *cup*. This sore is a sort of circular swelling. The meaning of *suggestion* in '*take suggestion*' (29) is easily determined by the context. To '*take suggestion*' is probably much the same as to 'take the hint,' or to 'yield to temptation.'

Of the adjectives, *lush* means 'of a full, dark colour,' the opposite of pale. *Tawny* is for *tanny*, *i.e.*, resembling that which has been tanned by the sun, *i.e.*, sunburnt.

Four adverbs display features of interest. Adverbs in *ly* are usually compared by means of *more* and *most*. But Shakspere writes *wiselier* (21), instead of 'more wisely.' *Chirurgeonly* (24) means 'like a surgeon,' *i.e.*, *skilfully*. *Surgery* is the shortened form of *chirurgy*, a Greek word, meaning, literally, 'handiwork'; but subsequently applied to that particular branch of handiwork which we call 'surgery.' This word affords a good instance of the restriction, or 'specialisation,' of a word's meaning. *Wondrous* is for 'wondrously' in '*wondrous heavy*' (26). *Feater* (29) is, of course, for 'more featly'; and with this we may compare *truer* for 'more truly' (21).

Where, by the way, did Shakspere meet with that sweetly-sounding name of Claribel? No such person is famous in history; but a certain Claribel was a mistress of Richard the First and the mother of Lord Falconbridge.

The student who is fond of a grammatical puzzle may give his opinion with regard to the correctness or otherwise of the expression, '*Which, of he, or Adrian, begins first*' (21). Ought we to use the nominative case after a preposition?

What is the force of the *a* in '*go a bat-fowling*'? (26). It is simply the worn-out preposition *on*, and denotes the direction or purpose of the action. '*O, what might*' (26) is, of course, an elliptical expression for 'O, what might come to pass!' The mark of exclamation would, we think, have been more proper here than that of interrogation. Two or three other instances of ellipsis are worth noting. One is '*if heed me*' (27), where *you* must, of course, be supplied from the preceding line; and in the last '*she that from whom*' (28,) in the speech of Antonio about the queen of Tunis, we must understand *in coming* before the words *from whom*, after having struck out the word *that*, which is a meaningless expression that has found its way into the text in consequence of the phrase *she that* having been used three times before by the same speaker. Again, in '*Ambition cannot pierce a wink beyond, but doubt discovery there*' (28), it seems almost necessary to supply the words *and cannot* before the words *but doubt*. Mr. Wright's note directs us to explain *doubt discovery* as meaning 'feel uncertain as to what it finds.'

In examination papers on a play of Shakspere, the student is frequently directed to 'mention the context of' certain passages; his acquaintance with the whole work being thus tested by his ability or inability to take a few words, detached from their surroundings, and mention how they are connected with the rest of the play. He might be asked, for instance, to mention the position in the discourse of the passages following:—

(*a*) 'His word is more than the miraculous harp.'
(*b*) 'Bate, I beseech you, Widow Dido.'
(*c*) 'That sort was well fished for.'

To which questions he will make answer somewhat in this wise:—

(*a*) 'Antonio suggests that Gonzalo's knowledge of geography is as wonderful as the harp of Amphion or Apollo. They raised walls by the aid of music. He brings them before us by his powerful imagination.'

(*b*) 'When Antonio says that Claribel is the rarest queen that ever came to Tunis, Sebastian bids him make an exception of Dido.'

(*c*) 'When Gonzalo has asserted (wishing to make the best of things) that his doublet was as fresh, *in a sort*, as the first day he put it on, Antonio intimates that there is a great deal of sense in that reservation, "in a sort."'

The student may easily test his own knowledge by asking himself similar questions.

Some of the most remarkable transpositions in the order of the words are: '*I not doubt*' (24), '*Would I not have*' (25), the very frequent expression, '*Good my lord*' (27), and '*You more invest it*' (27), for 'I doubt not,' 'I would not have,' 'My good lord,' and 'You invest it the more.'

Has the student detected any satirical allusions on the part of our author to the various Utopian treatises of government which were then attracting attention, and the impracticable, and sometimes inconsistent, schemes therein recommended? Perhaps Shakspere had some of these in his mind's eye when he made Antonio say, '*The latter end of his commonwealth forgets the beginning.*'

Though the name Utopian now stands for everything that is impracticable in the way of schemes for the improvement of society, we shall do well to remember in connection with it the following remark of a literary Frenchman:—

'Utopia! such is the name with which ignorance, folly, and incredulity have always characterised the great conceptions, discoveries, enterprises, and ideas which have illustrated the ages, and marked eras in human progress.'

We will conclude with a reference to that remarkable expression in which the poet speaks of conscience as the Deity in a man's bosom.

Bishop Taylor, in his 'Rule of Conscience,' says as follows:—

'God hath given us conscience to be in God's stead to us; to give us laws, and to exact obedience of those laws; to punish them that prevaricate, and to reward the obedient. And therefore Conscience is called the Household Guardian, the Domes-

tick God, the Spirit or Angel of the place. And when we call God to witness, we only mean that our conscience is right, and that God and God's vicar—our conscience—knows it.'

[The author regrets that the last article accidentally went to press with a Latin quotation unfinished. In the same article, *nor* must be substituted for *than*, in the twelfth line from the bottom of the second column of page 55.]

*(To be continued.)*

## Correspondence.

*Merchant Taylors' School, E.C., April 1, 1885.*

SIR,—As a joint-editor of Dr. Lange's 'German Classics,' I feel highly flattered by your review of 'Kalif Stork and the Phantom Crew.' As joint-editor of the latter book I have (unintentionally, I am sure) been misrepresented by your reviewer, who has attempted to hoist me with my own petard. I claim, in justice, a few words of explanation. 'Kalif Stork,' published in 1880 (why do you not give the date?), is simply a reprint of 'Selections from Hauff's Stories', published in 1879. In the preface to the larger work, a full explanation is given of the method of editing (or not editing, as your reviewer calls it) adopted by me and Mr. Mullins. I will say nothing in its defence, except that it has the authority of Mr. Quick, a past master in methods of teaching.

'There is no account whatever of Hauff.' Does the reviewer really think it necessary or even expedient that a boy or girl who is starting German should know the literary history of Hauff before reading his Märchen? Would he treat a boy who is beginning Latin on Phaedrus to a disquisition on Æsop, Babrius, Aphonius, and Ælian? Is not this captious criticism? 'All the words could be found equally well in a dictionary.' If the reviewer had taken the trouble to refer to the preface above-mentioned, he would have seen that the very object of the book is to supersede the dictionary in this first stage of learning a language. Would such a word as 'ziehen' be found *equally well* in a dictionary? Only one example is given of the difficulty and confusion that the pupil will find in using the book. 'Wohl' is translated 'well.' 'Immediately below it the phrase "Es war ihm wohl," is translated—and more or less correctly translated—"He was happy." Here the confused pupil finds that "wohl" means both "well" and "happy," and probably he has already found that it means "perhaps," and that when added to "doch," etc., etc. What confusion, I ask, is there here? Will not the pupil know, or cannot his master remind him, of 'O well is thee, and happy shalt thou be?' Would it not be confusion worse confounded if we had done as the reviewer bids us, and given the pupil (a child, remember, of twelve) the dozen or more idiomatic meanings and shades of meanings of 'wohl'? Dr. Lange, writing for elder pupils, is quite right in giving them, and we, I contend, in spite of your reviewer, would be as wrong.—I am, your obedient servant, F. STORR.

*To the Editor of* THE PRACTICAL TEACHER.

SIR,—Mr. Storr complains that I have misrepresented him, but his own letter is a complete answer to this charge. Mr. Storr does not dispute any one of my statements: that he thinks his work well, I ill, done, is a matter of opinion.

That '"Kalif Stork" is simply a reprint' is nothing germane to the matter. The date of Mr. Storr's original edition (not given, by-the-by, in the 'reprint'), and of this later one, are also quite beside the question. With the 'preface to the larger edition' I have no concern. If Mr. Storr's small books can only be understood by the aid of his larger ones, he should state this distinctly. No such statement appears in this 'reprint,' and the reviewer was bound, therefore, to consider the little volume solely on its own merits. I reviewed one book, and Mr. Storr reproaches me for not 'troubling to read the preface' to another.

Next Mr. Storr asks whether 'the reviewer really thinks it necessary, or even expedient, that a boy or girl who is starting German should know the literary history of Hauff before reading his Märchen? To begin with, I did not say a 'literary history' was necessary. Secondly, I do most emphatically think a child should know something at least of the author read, and that a slight account of (not a 'disquisition' on) this author, be he Æsop, or Babrius, or Phaedrus, would make the work doubly interesting. The child who knows a little about the emancipated slave Phaedrus, or the unemancipated, hunchbacked slave Æsop, will not enjoy the fables less, but more.

Then Mr. Storr asks me if the word 'ziehen' could be *equally well* found in a dictionary. Most assuredly! And probably with considerably less trouble than in Mr. Storr's vocabulary, which, like the maze at Hampton Court, is easy to enter but difficult to get out of.

Mr. Storr's next grievance is that I gave only 'one example' of the confusion a young pupil was like to fall into in using this book. One such example, like Mercutio's wound, 'is enough. 'Twill serve.' And referring to this example, Mr. Storr pathetically asks, 'Will not the pupil (a child of twelve!) know, or cannot his master remind him of, "O well is thee, and happy shalt thou be?"' I have no hesitation in replying that most children of twelve will remember nothing of the kind. The suggestion that the teacher shall supply the information the editor of this little story has failed to give, is the most striking proof that I have in no way exaggerated the shortcomings of his work. Such 'readers' as these must be so edited that children can work with them unaided, or they are superfluous. If the teacher has constantly to be referred to, any ordinary, unannotated little German edition would answer the purpose as well as these 'reprints.'

In conclusion, I will but remind Mr. Storr that I speak not only in my capacity of reviewer, but also in that of 'practical teacher.' In both capacities I find his work wanting. To say so, is to be neither 'captious' nor unjust.—Yours obediently, THE REVIEWER.

*London, April 11, 1885.*

## The 'Practical Teacher' Prize Competition for Pupil Teachers.

MARCH NUMBER, 1885.

THE following is the list of Prize Winners and Competitors in the above competition:—

FIRST YEAR.

*First Prize.*—'Jago Madwyn.' James Lester Mills, Glandwr Board Schools, Llanidloes, Montgomery.

*Second Prize.*—'Courage.' Laura M. Boucher, Board Infant School, Dartmouth, Devon.

Other papers; Margaret of Anjou, Simney, Allie, Hopeful (Lytham), Bythych, Erato, Psyche, Hector, Spectator, J. H. Tosswill, Scribo, Audax, Coma, Will, Seagull, Perseverance, A Young P. T., Beta, Alpha, Puzzled, Anxious, Cyanogen, Humble, Tempus Fugit, George Morris, Labor et Spes, K.A.W.A., Hopeful, Hopeless, Caradog, J. Bell, Constance Leslie, Spero, Courage and Duty, Anemone, Corda Unum, Boadicea, Topsy, Mountjoy, Perseverance 15, Stephenia, Hilda, Ivanhoe, Olivette, Try, Mistletoe, Bravinium, Florence McKenzie, A. Stark, Woolstone.

SECOND YEAR.

*First Prize.*—'Selina.' Alice S. Hughes, Lady Southampton's School, Kenchester, near Hereford.

*Second Prize.*—'J. H. L.' James Henry Lucas, Plusbay Linkinhorne, near Callington, Cornwall.

Other papers: Anxious to Win, Columba, F.H.T., Sunshine, Brutus, Alpha, J. Roland, Rota, Amor Patria, Cyril Ernstone, Hard-up, Julius Cæsar, Anxious, Ambitious, Shalstone, P.O.O., Welshwoman, Ada M. Griffiths, Queen, Eva, Try-hard, Pansy, Cinderella, Would-be Scholar, Tilly Whim, Rhys, Industry, Beeswax, Esther A. Boydall, Sneintonia.

THIRD YEAR.

*First Prize.*—'Rivington Pike.' Ralph Herbert Dickinson, British Schools, Horwich, Lancashire.

*Second Prize.*—'Shamrock.' Elinor Victoria Jones, Board Infant School, Dartmouth, Devon.

Other papers: The Claimant, Xit, James A. Williams, Ynothna, Juvenis, Zew, Labor Omnia Vincit, Nil Desperandum, Nemo, Casca, Lucy Johnson, Hope, Laurel, Aspirant, Gertrude Whiten, Holly, Primrose, Pevenis, Hopeful, L. J. Redgill, M. A. Ryport.

FOURTH YEAR.

*First Prize.*—'Diligent.' Robert Williams, Glanypwll Board School, Blaenan, Festiniog, N. Wales.

*Second Prize.*—'Sunshine.' Jemima Blackburn, 90, Upper Earle Street, Manchester Road, Bradford, Yorkshire.

Other papers: Hollyhock, Gordon, Daisy, Courtney, Buller, Annie Burke, Nil Desperandum, Boscawen, Lollypop, Unity, Espérance, Elia, Esperior, Julius Agricola Lexicon, Fireaway, Salopian.

# Query Column.

## RULES.

1. Each correspondent is restricted to *one question*. We should be much obliged if correspondents, who send questions for solution, would give (if possible) the required answer, and the source from which the question is obtained.

2. No query can be answered unless accompanied by the real name and address of the sender, not necessarily for publication, but as a guarantee of good faith and for facility of reference.

3. ☞ When a pseudonym is adopted it should be written at the end of the query, and the real name and address on a separate piece of paper.

4. Correspondents are requested to write their queries *legibly*, and on one side of the paper only.

5. Replies will not be sent through the post.

6. Queries must reach the office *not later than the 12th of the month*, or they cannot be attended to in the following issue.

*** All communications for this column should be addressed—'*The Query Editor*,' *The Practical Teacher*, *Pilgrim Street, Ludgate Hill, London, E.C.*

### Arithmetic.

1. ASSISTANT.—A person sold a quantity of 3 per cent. stock at 95; he invested half the proceeds in 5 per cent. railway bonds at 106, and the other half on a mortgage at 4½ per cent.: the brokerage for transfer of the stock was £2 9s. 8½d., and the cost of drafting and executing the mortgage deed was £15. After these charges had been paid out of the first year's income, there remained 15s. 6d. more than the previous income from the 3 per cent. stock. How much of this stock was sold? (*Second Class Clerkship Paper, India Office.*)

Income on £100 stock transferred to railway bonds
$= £5 \times \frac{95}{106}$
$= £\frac{475}{106}$
$= £4\ 9s.\ 7\frac{3}{53}d.$;

Income on £100 stock transferred to mortgage
$= £4\frac{1}{2} \times \frac{95}{100}$
$= (\frac{9}{2} \times \frac{19}{20})£$
$= \frac{171}{40}£$
$= £4\ 5s.\ 6d.$;

∴ Income on £200 stock transferred = £4 9s. 7$\frac{3}{53}$d. + £4 5s. 6d.
= £8 15s. 1$\frac{3}{53}$d.;

∴ Gain in income on this transfer of stock = £8 15s. 1$\frac{3}{53}$d. − £6
= £2 15s. 1$\frac{3}{53}$d.;

Gain in income = £2 9s. 8½d. + £15 + 15s. 6d.
= £18 5s. 2½d.

| £ | s. | d. | | £ | s. | d. | | £ | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 15 | $1\frac{3}{53}$ | : | 18 | 5 | $2\frac{1}{2}$ | :: | 200 | : Amount of stock |
| 20 | | | | 20 | | | | 50 | sold out. |
| 55 | | | | 365 | | | | | |
| 12 | | | | 12 | | | | | |
| 661 | | | | 4382 | | | | | |
| 53 | | | | 4 | | | | | |
| 2008 | | | | 17529 | | | | | |
| 3305 | | | | 53 | | | | | |
| 35058 | | | | 52587 | | | | | |
| | | | | 87645 | | | | | |
| | | | | 929037 | | | | | |
| | | | | 50 | | | | | |

35058)46451850(1325£. Ans.
35058
113938
105174
87645
70116
175290
175290

2. INQUISITIVE.—In a cricket match the highest score was ⅕ of whole, the next four scores amounted to ⅜, the other six to $\frac{11}{35}$, and there were 5 wides. Find total score. (*Dalton.*)

$\{1 - (\frac{1}{5} + \frac{3}{7} + \frac{11}{35})\}$ of Total Score = 5,
$\left(1 - \frac{7+15+12}{35}\right)$ of Total Score = 5,
$(1 - \frac{34}{35})$ of Total Score = 5,
$\frac{1}{35}$ of Total Score = 5,
∴ Total Score = 5 × 35
= 175. Ans.

3. LINDSAY.—A man invested a sum of money in the 3 per cent. consols at 88, and at the end of 4½ months, after receiving one half-year's dividend, sold out at 87¼. At what rate per cent. per annum did he receive interest on his capital? (*Civil Service*, 1873.)

Gain on an investment of £88 in 4½ months
$= (\frac{1}{2}$ of £3$) - £\frac{1}{2}$
$= £1$;

| £ | £ | | |
|---|---|---|---|
| 88 | 100 | | £ |
| months | months | :: | 1 : Rate per cent. per annum on |
| 4½ | 12 | | capital. |

$= \frac{100 \times \overset{3}{12}}{\underset{1}{88} \times \underset{3}{9}}£$
$= \frac{100}{11}£$
$= 9\frac{1}{11}$ per cent. Ans.

4. M. H.—An express train starts from a station A at one o'clock for a station B at 30 miles an hour, and in 15 mins. is followed by an ordinary train at 20 miles an hour. A train from B to A at 25 miles an hour, after travelling one hour, meets the express, and in 20 mins. more meets the ordinary train. At what time did the train leave B? (*Hamblin Smith.*)

Distance between train from B and ordinary train when it met the express = $\frac{3}{7}$ of (25 + 20) miles
= ⅓ of 45 miles
= 15 miles;

Distance between express and ordinary trains at the starting of ordinary train = $\frac{11}{3}$ of 30 miles
= $7\frac{1}{3}$ miles;

Time for express train to gain $(15 - 7\frac{1}{3})$ miles, or $7\frac{1}{3}$ miles
= $\frac{7\frac{1}{3}}{30 - 20}$ of 1 hour
= $\frac{11}{15}$ of 1 hour
= $\frac{3}{4}$ hour;

∴ Express train had travelled (¾ hr. + 15 min.), or one hour when it met the train from B;

∴ Train from B left at the same time as the express, viz., one o'clock.

5. GRADUS.—If I buy 3 per cents. at 78⅛ and 3½ at 95 1/16, which is the better investment? If I had invested £6962 19s. 3½d. in each, and the former rose and the latter fell 1/16, how much should I lose or gain? (*Colenso.*)

Income on £1 in the 3 per cents. $= \frac{3}{78\frac{1}{8}}$ £

$= \frac{1}{26\frac{1}{24}}$ £

$= \frac{8}{209}$ £;

" " 3½ " $= \frac{3\frac{1}{2}}{95\frac{5}{16}}$ £

$= \frac{7}{1523}$ £

$= \frac{8}{1189\frac{1}{3}}$ £;

∴ 1st investment : 2nd investment :: $\frac{8}{209}$ : $\frac{8}{1189\frac{1}{3}}$,

:: 8 × 1523 : 56 × 209,

:: 12184 : 11704;

∴ The 3 per cents. is the better investment.

£ £ s. d. £

78⅛ : 6962 19 3½ :: 1/16 : Gain on 1st investment.

8

627

2 £ s. d. £ s. d.

1254)6962 19 3½(5 11 0½ ¼ Gain.

6270

692

20

13859

13794

65

12

783

4

3135

2508

627

£ £ s. d. £

95 5/16 : 6962 19 3½ :: 1/16 : Loss on 2nd investment.

16 £ s. d. £ s. d.

1523)6962 19 3½(4 11 5¼ Loss.

6092

870

20

17419

16753

666

12

7995

7715

280

4

1523

1523

∴ Gain = £5 11s. 0¾d. − £4 11s. 5¼d.

= 19s. 7½d. Ans.

6. PUPIL TEACHER.—What numbers of four digits each can have 119 as their Greatest Common Measure, and 13923 as their Least Common Multiple? (*Lower Division*, September, 1884.)

13923 = 119 × 117 = 119 × 9 × 13;

∴ Nos. = (119 × 9) and (119 × 13) = 1071 and 1547. Ans.

7. RONA.—The population of a city is a million; it rises 1½ per cent. for three years successively; find the population at the end of 3 years. (*Barnard Smith.*)

1½ p. c. = 1,000,000 / 15,000

1,015,000 = Population at end of 1 year.

1½ p. c. = 1,015,000 / 15,225

1,030,225 = Population at end of 2 years.

1½ p. c. = 1,030,225 / 15,453·375

1,045,678·375 = Population at end of 3 years.

8. MONFAT.—Find the respective times between 7 and 8 o'clock, when the hour and minute hands of a watch are (*a*) exactly opposite; (*b*) at right angles to each other; (*c*) coincident.

The minute-hand moves 12 times as fast as the hour-hand:

∴ The difference between the rates of the minute and the hour-hands is 11 times the rate of the hour-hand.

(*a*) The minute-hand must gain 5 minutes on the hour-hand to be exactly opposite;

∴ Distance gone by hour-hand = 5 min. ÷ 11 = 5/11 min.

∴ Time when the hands are exactly opposite

= 5 5/11 min. past 7.

(*b*) The minute-hand must gain 20 min. and 50 min. respectively on the hour-hand to be at right angles to each other;

∴ Distance gone by hour-hand = 20 min./11 and 50 min./11

= 1 9/11 min. and 4 9/11 min.;

∴ Time when the hands are at right angles to each other

= 21 9/11 min. past 7, and

54 6/11 min. past 7, *i.e.*,

5 6/11 min. to 8.

(*c*) The minute-hand must gain 35 minutes on the hour-hand to be coincident;

∴ Distance gone by hour-hand = 35 min./11

= 3 2/11 min.;

∴ Time when the hands are coincident

= 38 2/11 min. past 7, *i.e.*,

21 9/11 min. to 8.

9. NORTHANTS.—A speculator buys shares when they are at 19½, £15 having been paid up, and sells them again at £32 9s., when £25 has been paid up. How much per cent. does he gain or lose? (*Moffat's* 'Pupil Teachers' Course.')

Total cost of a share = £19½ + (£25 − £15)

= £29½;

Gain on a share = £32 9s. − £29 10s.

= £2 19s.;

£ s. £ £ s.

∴ 29 10 : 100 :: 2 19 : Gain per cent.

20 20

590 59

= 10 per cent. gain. Ans.

10. TYRO.—Divide £1050 into four parts, such that the respective interests on the first at 2½ per cent. for 4 months, on the second at 3 per cent. for 4 months, on the third at 4 per cent. for 5 months, and on the fourth at 5 per cent. for 6 months may all be equal. (*Men Clerkships, Lower Division*, September, 1884.)

2½ × ⅓, 3 × ¼, 4 × 5/12, 5 × ½

= ⅚, 1, ¾, ½;

The parts must be in the proportion of the reciprocals of these numbers, that is, of

6/5, 1, 4/3, 2/3;

Sum = 19/5;

£1,050 ÷ 16 = £65 12s. 6d.;

£ s. d.

∴ 1st part = £65 12s. 6d. × 6 = 393 15 0

2nd " = " × 5 = 328 2 6

3rd " = " × 3 = 196 17 6 } Ans.

4th " = " × 2 = 131 5 0

## Algebra.

1. R. B.—Of two snails one can travel 20 feet in half an hour less than the other. The slower of the two starts to crawl up a chimney stalk, and reaches the top in 14 hours. The faster starts at the same time as its slower comrade, but it is 10 feet from the foot of the stalk. Determine the height of the stalk. (*Cassell's* 'Saturday Journal.')

Let $x$ = Height of the stalk in ft.,

Then, $\frac{x}{14}$ = Rate per hour of slower snail n .

And, $20 \div \frac{x}{14}$ or $\frac{280}{x}$ = No. of hrs. it takes slower snail to crawl 20 ft.;

∴ $\frac{280}{x} - \frac{1}{2}$ = No. of hrs. it takes faster snail to crawl 20 ft.

∴ $\frac{x+10}{14} = \frac{20}{\frac{280}{x} - \frac{1}{2}}$

$$\frac{x+10}{14}=\frac{20}{\frac{560-x}{2x}}$$

$$\frac{10+x}{14}=\frac{40x}{560-x}$$

$$5600+550x-x^2=560x$$

$$x^2+10x=5600$$

$$x^2+10x+(5)^2=5600+25$$

$$=5625$$

$$x+5=\pm 75$$

$$x=\pm 75-5$$

$\therefore$ $x=\underline{70, \text{ or } -80}$.

$\therefore$ Height of stalk $=\underline{70 \text{ ft.}}$

2. CLEMENS.—Solve :—

$$\sqrt{5x+1}-\sqrt{3x+7}=\sqrt{2x-6}. \quad (\textit{College of Preceptors.})$$

$$\sqrt{5x+1}-\sqrt{3x+7}=\sqrt{2x-6}$$

Squaring each side $\}$ $5x+1-2\sqrt{(5x+1)(3x+7)}+3x+7=2x-6$

$$8x+8-2\sqrt{15x^2+38x+7}=2x-6$$

$$6x+14=2\sqrt{15x^2+38x+7}$$

$$3x+7=\sqrt{15x^2+38x+7}$$

Squaring $\}$ $9x^2+42x+49=15x^2+38x+7$

$$6x^2-4x=42$$

$$x^2-\frac{2x}{3}=\frac{21}{3}$$

$$x^2-\frac{2x}{3}+(\tfrac{1}{3})^2=\tfrac{21}{3}+\tfrac{1}{9}$$

$$=\frac{63+1}{9}$$

$$=\frac{64}{9}$$

$$x-\tfrac{1}{3}=\pm\tfrac{8}{3}$$

$$x=\pm\tfrac{8}{3}+\tfrac{1}{3}$$

$\therefore$ $\underline{x=3, \text{ or } -\tfrac{7}{3}}$.

Or,

$$3x+7=\sqrt{(5x+1)(3x+7)}$$

Dividing by $\sqrt{3x+7}$ $\}$ $\sqrt{3x+7}=\sqrt{5x+1}$

$$3x+7=5x+1$$

$$2x=6$$

$\therefore$ $\underline{x=3}$.

As we divided by $\sqrt{3x+7}$, we can put

$$\sqrt{3x+7}=0$$

$$3x=-7$$

$\therefore$ $\underline{x=-\tfrac{7}{3}}$.

$\therefore$ $\underline{x=3, \text{ or } -\tfrac{7}{3}}$.

3. WILLIAMS.—How many words can be formed, consisting of 3 consonants and one vowel, in a language containing 19 consonants and 5 vowels? (*Hamblin Smith.*)

Out of the 19 consonants we get $\frac{19.18.17}{1.2.3}$ combinations of 3 consonants,

$\therefore$ No. of combinations of 3 consonants and one vowel

$$=\frac{19.18.17}{1.2.3}\times 5;$$

Each combination of 4 letters gives $\lfloor 4$ permutations;

$\therefore$ No. of words $=\frac{19.18.17}{1.2.3}\times 5\times \lfloor 4$

$$=19\times 18\times 17\times 5\times 4$$

$=\underline{116,280}$. Ans.

4. C THOMPSON.—Solve :—

$$\left.\begin{aligned} x^2+2xy-y^2&=a^2+2a-1\\ (a-1)\,x(x+y)&=a(a+1)\,y(x-y)\end{aligned}\right\}$$ (*Todhunter's* 'Algebra for Beginners.')

$$\left.\begin{aligned}(1)\quad x^2+2xy-y^2&=a^2+2a-1\\ (2)\quad (a-1)\,x(x+y)&=a(a+1)\,y(x-y)\end{aligned}\right\}$$

$$(2)\quad \frac{x(x+y)}{y(x-y)}=\frac{a(a+1)}{a-1}$$

$$\frac{x^2+xy}{xy-y^2}=\frac{a^2+a}{a-1}$$

$$\left.\begin{aligned}\text{Numerator}+\text{Denominator}\\ \text{Denominator}\end{aligned}\right\}\quad \frac{x^2+2xy-y^2}{xy-y^2}=\frac{a^2+2a-1}{a-1}$$

But, $x^2+2xy-y^2=a^2+2a-1$ (1)

$\therefore$ $xy-y^2=a-1$,

And, $x^2+xy=\underline{a^2+a}$;

$$\left.\begin{aligned}x(x+y)&=a(a+1)\\ y(x-y)&=a-1\end{aligned}\right\}$$

Multiplying $\}$ $xy(x^2-y^2)=a(a^2-1)$

$$\therefore\ x^2-y^2=\underline{\frac{a(a^2-1)}{xy}}.$$

$$(1)\quad 2xy+x^2-y^2=a^2+2a-1$$

$$2xy+\frac{a(a^2-1)}{xy}=a^2+2a-1$$

$$2x^2y^2-xy(a^2+2a-1)=-a(a^2-1)$$

$$x^2y^2-\frac{xy(a^2+2a-1)}{2}=-\frac{a(a^2-1)}{2}$$

$$x^2y^2-\frac{xy(a^2+2a-1)}{2}+\left(\frac{a^2+2a-1}{4}\right)^2$$

$$=-\frac{a^3-a}{2}+\frac{a^4+4a^3+2a^2-4a+1}{16}=\frac{a^4-4a^3+2a^2+4a+1}{16}$$

$$xy-\frac{a^2+2a-1}{4}=\pm\frac{a^2-2a-1}{4}$$

$$xy=\frac{\pm(a^2-2a-1)+a^2+2a-1}{4}$$

$\therefore$ $xy=a$, or $\underline{\frac{a^2-1}{2}}$.

$$x^2+xy=a^2+a$$

$$x^2=a^2+a-a, \text{ or } a^2+a-\frac{a^2-1}{2}$$

$$=a^2, \text{ or } \frac{a^2+2a+1}{2}$$

$\therefore$ $x=\pm a$, or $\underline{\pm\frac{a+1}{\sqrt{2}}}$.

$$xy-y^2=a-1$$

$$y^2=a-(a-1), \text{ or } \frac{a^2-1}{2}-(a-1)$$

$$=1, \text{ or } \frac{a^2-2a+1}{2}$$

$\therefore$ $y=\pm 1$, or $\underline{\pm\frac{a-1}{\sqrt{2}}}$.

5. W. J. HACKER.—Cannon balls are piled in a regular square-based pyramid, one ball at the top and 121 in the layer lying on the ground. What is the average number of balls in a layer? (*Pupil Teachers' Course.*)

No. of balls in a side of the bottom layer $=\sqrt{121}$

$$=11;$$

$\therefore$ No. of layers $=11$.

If $n$ represent No. of balls in a side of the bottom layer,

Then, No. of all the balls $=\frac{1}{6}n(n+1)(2n+1)$;

$\therefore$ Average number of balls in a layer

$$=\{\tfrac{1}{6}\times 11(11+1)(22+1)\}\div 11$$

$$=\frac{12\times 23}{6}$$

$=\underline{46}$. Ans.

6. IGNORAMUS.—What fraction exceeds twice its positive square root by $\frac{7}{9}$? (*College of Preceptors*, Christmas, 1882.)

Let $x^2=$ the fraction;

Then, $x^2-2x=\frac{7}{9}$

$$x^2-2x+1=\tfrac{7}{9}+1$$

$$=\tfrac{16}{9}$$

$$x-1=\pm\tfrac{4}{3}$$

$$x=\pm\tfrac{4}{3}+1$$

$\therefore$ $\underline{x=\tfrac{7}{3}, \text{ or } -\tfrac{1}{3}}$.

$\therefore$ Fraction $=(\tfrac{7}{3})^2=\underline{\tfrac{49}{9}}$. Ans.

7. JUVENIS.—The sum of two numbers is one-sixth of their product, and the sum of their squares is 325. Find the numbers. (*Todhunter's* 'Algebra for Beginners.')

Let $x$ and $y=$ the two Nos.;

Then, $\left.\begin{aligned}(1)\ x+y&=\frac{xy}{6}\\ (2)\ x^2+y^2&=325\end{aligned}\right\}$

Squaring $\}$ $(1)\ x^2+2xy+y^2=\frac{x^2y^2}{36}$

Substituting from (2) $\}$ $2xy+325=\frac{x^2y^2}{36}$

$$x^2y^2-72xy=11700$$

$$x^2y^2-72xy+(36)^2=11700+1296$$

$$=12996$$

$$xy-36=\pm 114$$
$$xy=\pm 114+36$$
$$\therefore xy=\underline{150, \text{ or } -78}.$$

$$\left.\begin{aligned} x^2+y^2&=325\\ 2xy&=300\end{aligned}\right\}$$
$$\left.\begin{aligned} x^2+2xy+y^2&=625\\ x^2-2xy+y^2&=25\end{aligned}\right\}$$
$$\left.\begin{aligned} \therefore x+y&=25\\ x-y&=5\end{aligned}\right\}$$
$$\left.\begin{aligned} 2x&=30\\ 2y&=20\end{aligned}\right\}$$
$$\therefore \text{Nos.} = \underline{15 \text{ and } 10}.$$

8. S. MUIR.—The sum of two numbers multiplied by the greater is 77, and the difference multiplied by the less is 12. Find the numbers.

Let $x$ and $y$ = the two Nos.;

$$\text{Then, } \left.\begin{aligned}&(1)\ x(x+y)=77\\ &(2)\ y(x-y)=12\end{aligned}\right\}$$

(Put $vx$ for $y$)

$$\text{Then, } \left.\begin{aligned}&(1)\ x(x+vx)=77\\ &(2)\ vx(x-vx)=12\end{aligned}\right\}$$
$$\left.\begin{aligned}&(1)\ x^2(1+v)=77\\ &(2)\ vx^2(1-v)=12\end{aligned}\right\}$$

Dividing (1) by (2):
$$\frac{1+v}{v(1-v)}=\frac{77}{12}$$
$$12+12v=77v-77v^2$$
$$77v^2-65v=-12$$
$$v^2-\frac{65v}{77}=-\frac{12}{77}$$
$$v^2-\frac{65v}{77}+(\tfrac{65}{154})^2=\frac{4225}{154^2}-\frac{12}{77}$$
$$=\frac{4225-3696}{154^2}$$
$$=\frac{529}{154^2}$$
$$v-\tfrac{65}{154}=\pm\tfrac{23}{154}$$
$$v=\pm\tfrac{23}{154}+\tfrac{65}{154}$$
$$\therefore v=\tfrac{3}{7}, \text{ or } -\tfrac{11}{14}.$$

$$(1)\ x^2(1+v)=77$$
$$x^2(1+\tfrac{3}{7}), \text{ or } x^2(1-\tfrac{11}{14})=77$$
$$x^2=77\div\tfrac{10}{7}, \text{ or } 77\div\tfrac{3}{14}$$
$$=49, \text{ or } 1\tfrac{3}{4}1$$
$$\therefore \underline{x=7}.$$
$$y=vx$$
$$=\tfrac{4}{7}\times 7$$
$$=\underline{4}.$$
$$\therefore \text{Nos.} = \underline{7 \text{ and } 4}.$$

9. DISCIPULUS.—Solve:—

$$\left(\frac{2x}{3}-\frac{4y}{5}\right)\left(\frac{2x}{3}-\frac{4z}{5}\right)=2\left(\frac{2y}{3}-\frac{4z}{5}\right)\left(\frac{2x}{3}-\frac{4z}{5}\right)$$
$$=4\left(\frac{2x}{3}-\frac{4y}{5}\right)\left(\frac{2y}{3}-\frac{4z}{5}\right)=8.$$

(*College of Preceptors*, 1884.)

$$\left.\begin{aligned}&(1)\ \left(\frac{2x}{3}-\frac{4y}{5}\right)\left(\frac{2x}{3}-\frac{4z}{5}\right)=8\\ &(2)\ 2\left(\frac{2y}{3}-\frac{4z}{5}\right)\left(\frac{2x}{3}-\frac{4z}{5}\right)=8\\ &(3)\ 4\left(\frac{2x}{3}-\frac{4y}{5}\right)\left(\frac{2y}{3}-\frac{4z}{5}\right)=8\end{aligned}\right\}$$

$$\left.\begin{aligned}&\text{Dividing (1) by (2)}\}\quad \frac{2x}{3}-\frac{4y}{5}=2\left(\frac{2y}{3}-\frac{4z}{5}\right)(4)\\ &\text{,, (1) by (3)}\}\quad \frac{2x}{3}-\frac{4z}{5}=4\left(\frac{2y}{3}-\frac{4z}{5}\right)(5)\end{aligned}\right\}$$

$$\left.\begin{aligned}&(4)\ \frac{x}{3}-\frac{2y}{5}=\frac{2y}{3}-\frac{4z}{5}\\ &(5)\ \frac{x}{3}-\frac{2z}{5}=\frac{4y}{3}-\frac{8z}{5}\end{aligned}\right\}$$
$$\left.\begin{aligned}&(4)\ 5x-6y=10y-12z\\ &(5)\ 5x-6z=20y-24z\end{aligned}\right\}$$
$$\left.\begin{aligned}&(4)\ 5x-16y=-12z\\ &(5)\ 5x-20y=-18z\end{aligned}\right\}$$
$$\text{Subtracting}\quad 4y=6z$$
$$\therefore \underline{y=\tfrac{3z}{2}}.$$

$$(4)\ 5x-16y=-12z$$
$$5x=\left(\tfrac{3z}{2}\times 16\right)-12z$$
$$=24z-12z$$
$$=12z$$
$$\therefore x=\underline{\frac{12z}{5}}$$

$$(1)\ \left(\frac{2x}{3}-\frac{4y}{5}\right)\left(\frac{2x}{3}-\frac{4z}{5}\right)=8$$
$$\left(\frac{x}{3}-\frac{2y}{5}\right)\left(\frac{x}{3}-\frac{2z}{5}\right)=2$$
$$(5x-6y)\quad (5x-6z)=30$$
$$\left\{\left(\frac{12z}{5}\times 5\right)-\left(\frac{3z}{2}\times 6\right)\right\}\left\{\left(\frac{12z}{5}\times 5\right)-6z\right\}=30$$
$$(12z-9z)(12z-6z)=30$$
$$3z\times 6z=30$$
$$3z^2=5$$
$$z^2=\tfrac{5}{3}$$
$$\therefore \underline{z=\pm\sqrt{\tfrac{5}{3}}}.$$

$$x=\frac{12z}{5}$$
$$x^2=\frac{144z^2}{25}$$
$$=\frac{\cancel{3}}{\cancel{2}}\times\frac{\cancel{144}}{\cancel{25}}\ {}^{48}_{5}$$
$$=\tfrac{48}{5}$$
$$\therefore x=\pm\sqrt{\tfrac{48}{5}}$$
$$=\underline{\pm 4\sqrt{\tfrac{3}{5}}}.$$

$$y=\frac{3z}{2}$$
$$y^2=\frac{9z^2}{4}$$
$$=\frac{5}{\cancel{3}}\times\frac{\cancel{9}}{4}\ {}^{3}$$
$$=\tfrac{15}{4}$$
$$\therefore y=\pm\sqrt{\tfrac{15}{4}}$$
$$=\underline{\pm\tfrac{1}{2}\sqrt{15}}. \text{ Ans.}$$

## Mensuration.

1. J. H. R.—The diagonal of a cube of ivory is ·53 of an inch longer than the diagonal of one of its faces. What is the length of its edge? (*Hunter.*)

$$\text{Diagonal of face} = \sqrt{2\ \text{Length}^2};$$
$$\text{,, ,, cube} = \sqrt{\text{Length}^2+2\ \text{Length}^2}$$
$$=\sqrt{3\ \text{Length}^2};$$
$$\therefore \sqrt{3\ \text{Length}^2}-\sqrt{2\ \text{Length}^2}=\text{·53 in.},$$
$$(\sqrt{3}-\sqrt{2})\ \text{Length}=\text{·53 in.},$$
$$\therefore \text{Length}=\frac{\text{·53 in.}}{\sqrt{3}-\sqrt{2}}$$
$$=\frac{\text{·53}\times(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})}\ \text{in.}$$
$$=\frac{\text{·53}\times(\sqrt{3}+\sqrt{2})}{3-2}\ \text{in.}$$
$$=\{\sqrt{3\times(\text{·53})^2}+\sqrt{2\times(\text{·53})^2}\}\ \text{in.}$$
$$=(\sqrt{\text{·8627}}+\sqrt{\text{·5618}})\ \text{in.}$$
$$=(\text{·9288...}+\text{·7495...})\ \text{in.}$$
$$=1\text{·}6783...\text{in.}$$
$$\therefore \text{Length of edge} = \underline{1\tfrac{2}{3}\ \text{in. nearly}}. \text{ Ans.}$$

2. PERCY.—What length must be cut off a straight plank $1\frac{1}{2}$ ft. broad and $\frac{3}{4}$ ft. deep, in order that it may contain $11\frac{1}{4}$ cubic feet? (*Barnard Smith.*)

$$\text{Length} = 11\tfrac{1}{4}\ \text{cub. ft.} \div (1\tfrac{1}{2}\ \text{ft.}\times\tfrac{3}{4}\ \text{ft.})$$
$$=\tfrac{45}{4}\ \text{cub ft.}\div(\tfrac{3}{2}\times\tfrac{3}{4})\ \text{sq. ft.}$$
$$=\left(\frac{\cancel{45}}{\cancel{4}}\times\frac{5}{\cancel{3}}\times\frac{\cancel{4}}{\cancel{3}}\right)\text{ft.}$$
$$=\underline{12\tfrac{1}{2}\ \text{ft.}}\ \text{Ans.}$$

3. EDGAR A. ROSS.—A circle and a regular polygon of 12 sides have the same perimeter; show that the area of the circle $= \frac{3{\cdot}2154}{3{\cdot}1416}$ times the area of the polygon. (*Todhunter's* 'Mensuration for Beginners.')

If the side of the polygon is 1, the area $= 11{\cdot}1961524$;
Circumference of circle $= 12$;

$$\therefore \text{Area of circle} = \frac{12}{\pi} \times \frac{3}{\pi 3{\cdot}1416} \times \frac{1}{\pi} = \frac{36}{3{\cdot}1416};$$

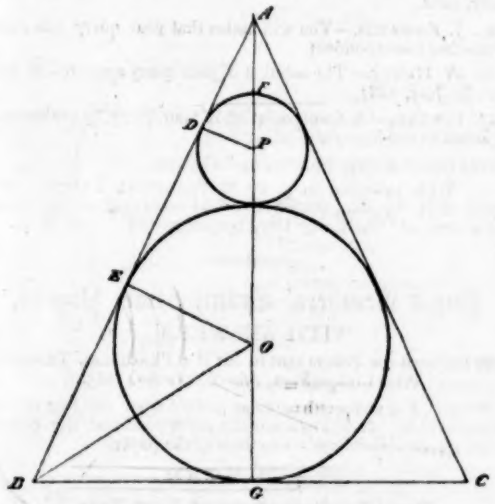
Area of circle : Area of polygon :: $\frac{36}{3{\cdot}1416}$ : $11{\cdot}1961524$;

$$\therefore \text{Area of circle} = \left(\frac{3}{\pi 3{\cdot}1416} \div \frac{11{\cdot}1961524}{{\cdot}9330127}\right) \text{times area of polygon}$$

$$\begin{array}{r|l} {\cdot}9330127 & 3{\cdot}0000000 \ (3{\cdot}2154 \text{ nearly.} \\ & 27990381 \\ & \overline{20096190} \\ & 18660254 \\ & \overline{14359360} \\ & 9330127 \\ & \overline{50292330} \\ & 46650635 \\ & \overline{36416950} \\ & 37320508 \end{array}$$

$\therefore$ Area of circle $= \frac{3{\cdot}2154}{3{\cdot}1416}$ times the area of the polygon.

4. RIDLEY.—In an isosceles triangle, two circles are inscribed touching each other and the sides of the triangle; the diameters of the circles are 9 and 25; required the sides of the triangle. (*Nesbit.*)




By similar triangles,

$$\begin{aligned} &AP : PO :: PD : OE, \\ &AF + FP : AF + FO :: 4\tfrac{1}{2} : 12\tfrac{1}{2}, \\ &AF + 4\tfrac{1}{2} : AF + 12\tfrac{1}{2} :: 9 : 25, \\ &25(AF + 4\tfrac{1}{2}) = 9(AF + 21\tfrac{1}{2}) \\ &25AF + 112\tfrac{1}{2} = 9AF + 193\tfrac{1}{2} \\ &25AF - 9AF = 193\tfrac{1}{2} - 112\tfrac{1}{2} \\ &16AF = 81 \\ &\therefore AF = 5\tfrac{1}{16}. \end{aligned}$$

$$\begin{aligned} AE^2 &= AO^2 - OE^2, \text{ (I. 47.)} \\ &= (AF + 21\tfrac{1}{2})^2 - (12\tfrac{1}{2})^2 \\ &= (5\tfrac{1}{16} + 4\tfrac{1}{2})^2 - (5\tfrac{1}{2})^2 \\ &= (\tfrac{477}{16})^2 - \tfrac{961}{4} \\ &= \tfrac{1}{256}\tfrac{2}{0}\tfrac{2}{0}\tfrac{7}{0}\tfrac{2}{0}\tfrac{8}{0} - \tfrac{1}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0} \\ &= \tfrac{14}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{2}{0}\tfrac{8}{0} \end{aligned}$$

$$\therefore AE = \tfrac{377}{16}.$$

$$AG^2 = \overline{AB^2} + BG^2,$$

$$\left(\begin{array}{l} \text{Now, } AB^2 = AE^2 + 2AE \,.\, EB + EB^2, \\ \text{And, } BG^2 = BE^2; \end{array}\right)$$

$$\therefore AG^2 = AE^2 + 2AE \,.\, EB + EB^2 - BE^2$$

$$(\tfrac{21}{16} + 34)^2 = \tfrac{14}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0} + (\tfrac{377}{16} \times 2 \times EB)$$

$$(\tfrac{565}{16})^2 = \tfrac{14}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0} + \tfrac{754}{16}EB$$

$$\tfrac{2}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0} - \tfrac{14}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0} = \tfrac{754}{16}EB$$

$$\tfrac{754}{16}EB = \tfrac{2}{256}\tfrac{0}{0}\tfrac{0}{0}\tfrac{0}{0}$$

$$EB = \frac{125}{\cancel{2000}} \times \frac{\cancel{8}}{377} = \frac{2}{3}$$

$$\therefore EB = 1\tfrac{2}{3}.$$

$$\begin{aligned} AB &= AE + EB \\ &= \tfrac{377}{16} + 1\tfrac{2}{3} \\ &= \frac{1125 + 1000}{48} \\ &= 21\tfrac{41}{48} \\ &= \frac{531{\cdot}25}{12} \\ &= 44{\cdot}27083\tfrac{1}{3}; \end{aligned}$$

$$\begin{aligned} BC &= 2BG = 2EB = 1\tfrac{2}{3} \times 2 \\ &= 3\tfrac{1}{3} \\ &= 41{\cdot}6. \end{aligned}$$

## General.

1. UN JEUNE ANGLAIS.—Nous avons le plaisir de vous transmettre notre commande pour divers articles que nous vous prions de nous expédier par train de marchandise de la Compagnie du Nord, frais de transport payés jusqu' à destination, soit :—

3 surtouts : Nos.
4 chapeaux : Nos.
3½ douzaines de faux—cols : Nos.
6½ douzaines de mouchoirs.
28¾ aunes de soie en trois couleurs, et un beau choix de cravattes.

Si cet achat est à notre gré, nous vous enverrons d'autres commandes. Nos conditions de paiement sont les suivantes : argent comptant en quinze jours, moins 3½ per cent. rabat.

Faites nous savoir si vous pouvez expédier ces articles de suite.

2. RUSTIC.—You will find the extract on page 17 of the 'People's Edition' (6s.) of the works of Lord Tennyson, published by Kegan Paul.

3. NONDESCRIPT.—The passage as you quote it is absurd, and you might well feel difficulty in parsing it. The lines are :

'Now let us sing, Long live the king,
And Gilpin, long live he.'

*Now*—adv. of time, qualg. *let*.
*let*—irreg. trans. verb, act., imp., pres., 2nd, plur., agreeing with its nom. *you* und.
*us*—pers. pro., com., plur., 1st, obj., gov. by *let*.
*sing*—irreg. trans. verb, act., inf., pres., gov. by *let*.
*long*—adj., qualg. *time* und.
*live*—reg. intrans. verb, act., inf., pres., gov. by *may* und., and forming with *may* the pot. mood, pres. tense of the verb *live*.
*king*—com. noun, masc., sing., nom. to *may live*.
*and*—cop. conj., joining the two sents., 'May the king live long' and 'May he live long.'
*Gilpin*—prop. noun, masc., sing., in app. with *he*.
*long*—adj., qualg. *time* und.
*live*—reg. intrans. verb, act., inf., pres., gov. by *may*.
*he*—per. pro., masc., 3rd, sing., nom. to *may live*.

4. FOX.—If you want one to put into the hands of scholars, the Code Standard English Grammar (Bell and Sons) is as good as any we know. If you want one for yourself, 'Manual of Parsing' (Allman) is the best.

5. MAGISTER.—The solution of your query appeared in our issue for October, 1882.

6. HAYCOCK.—Full instructions for working the problem are given in the text-book you mention.

7. STICKER.—The work 'sticked,' as used, is quite correct, and is grammatical as well. The use is entirely different from the word which means 'to pierce.' You must not be led away by the *sound* of the phrase, but stick closely to the meaning of the word, as in your contention. If you say, 'The peas are stuck,' then the only meaning which would be applied would be that of

piercing, and not that of placing sticks by them, as you wish to be understood is the case.

8. SIMILIS.—'Like' is from the A.S. *lic*, and is primarily an adjective. It is said by Dr. Latham to govern a case, and to be the only adjective which does so. Morell gives *worth* as doing the same. In A.S. the case governed by 'like' was the dative, and as the objective in English in some sense corresponds to the dative, 'like' is said to govern the objective case. We should parse *like*, in the sentence you give, as an adjective governing *him*. It may also be parsed as an adjective qualifying *man* as, 'I do not like a like man *to* him'; in which case 'him' is governed by *to*. It is in order not to ignore both the meaning and origin of the word that it is unwise to call it a preposition, as is sometimes done. It seems to partake of the character and perform the functions of a conjunction in such sentences as, 'He climbed the wall like a cat,' which might be rendered 'He climbed the wall like a cat would climb the wall.'

9. THE CLAIMANT.—

ANALYSIS.

| Sentence. | Kind of Sent. | Connective. | Subject. | Predicate. | Object. | Extension. |
|---|---|---|---|---|---|---|
| (*a*) | | | | | | |
| What conscience dictates to be done | Noun Sent. in app. with *that* in *a* | | conscience | dictates | what to be done | |
| (*b*) | | | | | | |
| *or* [what conscience] warns me not to do | Noun Sent. in app. with *this* in *c* | or | [conscience] | warns | me to do what not | |
| (*c*) | | | | | | |
| This teach me to shun more | Prin. Sent. | | [thou] | teach | me to shun this more | |
| (*d*) | | | | | | |
| than [I shun] hell | Adv. Sent. to *c* | than | [I] | [shun] | hell | much] |
| (*e*) | | | | | | |
| [teach me] to pursue that more | Prin. Sent. co-ord. with *c* | | [thou] | teach | me to pursue that more | |
| (*f*) | | | | | | |
| than [I pursue] heaven | Adv. Sent. to *e* | than | [I] | [pursue] | heaven | [much] |

*What*—comp. rel. pro., neut., sing., 3rd, obj., gov. by *dictates*.
*to*—particle, sign of inf. mood.
*be*—aux. to *done*, indicating pass. voice.
*done*—past. part. of *to do*, ref. to *what*.
*to be done*—irreg. trans. verb, passive, inf., pres., gov. by *dictates*.
*me*—pers. pro., com., sing., 1st, obj., gov. by *warns*.
*this*—adj. of distinction, qualg. *thing* und.
*teach*—irreg. trans. verb, act., imp., 2nd, sing., agreeing with *thou* und.
*me*—per. pro., com., sing., 1st, obj., gov. by *teach*.
*than*—cop. conj., joining the two sents., 'Teach me to shun this more,' and 'I shun hell much'
*that*—adj. of distinction, qualg. *thing* und.
*more*—adv. of number, qualg. *to shun*.
*pursue*—reg. trans. verb, act., inf., pres., gov. by *teach*.

10. THANKFUL.—You do not name any definite examination. For Drainage and Ventilation, read 'Hygiene,' Dr. Newsholme's Hygiene.
English Language and Literature. Good editions of the books selected.
Theory and Practice of Education (Fitch, and Sully).

11. CAXTON.—In Astronomy, *Ball's* Astronomy (Longman and Co., 6s.). In Geology, *Geikie's* Text-book (Macmillan). In Meteorology, *Scott's* volume in the International Series; add *Judd's* 'Volcanoes,' in the same series. *Findlater's* Manual, by Chambers, gives some general results in Chemistry and Physics. Consult *Nature* for the past five years.

12. G. M. F.—You have been misinformed. Passing the examination does not give you a claim to enter a Training College. If you wish to enter one, write to the secretary of it, and he will furnish you with all needful information free of charge.

13. WILLIAMS.—*Justin McCarthy's* 'History of our Own Times,' abridged edition, is published by Chatto and Windus, price 6s. See PRACTICAL TEACHER, vol. iii., page 93.

14. CAPYS.—It is difficult to see exactly what you want. You are not concerned about Bacon's maxim, but about success. If you find you cannot keep your attention fixed for two hours, work half an hour at a time. There must be attention and interest in your work, and repetition, or your progress will not be sure. Meditate during the day upon what you have done in the morning. Look at it from all points of view, and try to apply it. In Physical Science study the phenomena themselves, and, if possible, weigh and measure the quantities concerned.

15. LIVY.—See PRACTICAL TEACHER, vol. iii., page 93, for general advice. For Livy, book xxii., use Chambers' edition or Cape's; and for Euripides use the Pitt Press edition. The unseen passages set last Christmas, with translations, will appear in our next number.

16. JAMES EPPY.—About 65.

17. CRETONUM.—The small hand will pass creditably now; but the large hand is only moderate, and the mistakes are too frequent to enumerate. You must copy good models. Percentage, small hand, 85; large hand, 55.

18. STUDENT.—Small hand, 65; large hand, 80.

19. ———.—Write to Cassell and Co. They publish a book which may suit you.

20. S. B. D.—At present we know of no editions except *Teubner's*. No doubt annotated editions will be announced shortly.

21. EXCELSIOR.—The books you name are prescribed for reading, not for grammatical purposes, and no questions will be set upon them in the written examination, unless the same books are prescribed as part of the literature to be specially prepared.

22. CHEMICAL.—Your query was solved in our issue for February, 1882.

23. J. EDWARDS.—You will notice that your query was sent by another correspondent.

24. W. HENRY.—The solution of your query appeared in our issue for July, 1884.

25. PEVENIS.—A simple solution of your query, by arithmetic, appeared in our issue for April, 1884.

*To the Query Editor*, PRACTICAL TEACHER.

With reference to p. 87 of PRACTICAL TEACHER for April, 1885, the lines quoted by Fred Coates (20) are the opening stanzas of 'The Rainy Day,' by Longfellow. S. B. D.

# Pupil Teachers' Examination Papers,

## WITH ANSWERS

Selected from the Papers sent in for the PRACTICAL TEACHER Prize Competition, *March Number*, 1885.

NOTE.—The answers have been printed from the best of the papers sent in. It will be distinctly understood that the Editor is not responsible for the correctness of the papers.

## FIRST YEAR.

### Pupil Teachers at end of First Year.

*Three hours and a half allowed.*

### Arithmetic.

MALES.

1. What must be added to

$$\frac{\frac{1}{2}-\frac{1}{6}}{\frac{1}{2}+\frac{1}{6}} \times \frac{9\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}+3\frac{1}{2}} \div \frac{32\frac{1}{2}-20\frac{1}{2}}{10\frac{5}{8}+3\frac{1}{11}}$$

to make the total $8\frac{1}{2}$ of $\frac{3}{7}$ of $4\frac{1}{11}$?

$$\left(8\tfrac{1}{2}\times\tfrac{3}{7}\times\tfrac{45}{11}\right) - \left(\frac{6-5}{6+5}\times\frac{32\frac{1}{2}-31\frac{1}{2}}{9\frac{1}{2}+\frac{5}{8}} \div \frac{49\frac{9}{10}-21\frac{1}{2}}{13\frac{1}{2}+\frac{4}{11}}\right)$$

$$= \left(\tfrac{17}{2}\times\tfrac{3}{7}\times\tfrac{45}{11}\right) - \left(\tfrac{1}{11}\times\frac{1}{\frac{85}{8}}\div\frac{28\frac{1}{10}}{17\frac{6}{11}}\right)$$

$$= \left(\frac{17\times3\times45}{2\times7\times11}\right) - \left(\tfrac{1}{11}\times\tfrac{8}{85}\times\tfrac{281}{10}\right)$$

$$= 11\tfrac{17}{22} - \left(\frac{1\times8\times281}{11\times85\times10}\right)$$

$= 2\frac{1}{149}\frac{7}{9} - \frac{1}{149}\frac{8}{9}\frac{5}{1}\frac{0}{0} = \frac{2155329 - 8850}{149919}$

$= \frac{2146479}{149919}$ or $14\frac{4}{7}\frac{7}{9}\frac{3}{1}\frac{9}{0}$ or $14\frac{4}{7}\frac{7}{9}\frac{3}{1}\frac{9}{0}$.

$14\frac{4}{7}\frac{7}{9}\frac{3}{1}\frac{9}{0}$. Ans.

2. From a field containing 4·25 acres, $\frac{1}{4}\frac{1}{0}$ of an acre was fenced off, and the remainder marked out into 18 plots; how many sq. poles did each contain?

$(4\frac{1}{4}\frac{1}{0} - \frac{1}{4}\frac{1}{0}) \div 18$ = number of acres in each plot.

$= \frac{4\,2\,1}{1\,0\,0} - \frac{1}{4}\frac{1}{0} = \frac{3\,7\,8}{1\,0\,0}$

$\frac{3\,7\,8}{1\,0\,0} \div 18 = \frac{\cancel{3\,7\,8}^{\,21}}{1\,0\,0} \times \frac{1}{\cancel{1\,8}_{\,1}} = \frac{2\,1}{5\,0}$ or $\frac{7}{1\,6\,\frac{2}{3}}$ acres.

$= \frac{7}{1\,6\,\frac{2}{3}}$ acres $= \frac{7}{1\,6\,\frac{2}{3}} \times \frac{3}{1} \times \frac{1\,6\,\frac{1}{2}}{1}$ sq. poles

$= 3\frac{1}{1\,6\,\frac{2}{3}}\,\frac{6}{0}$ or $33\frac{3}{1\,6\,\frac{2}{3}}$ or 33·93 sq. poles.

$33\frac{3}{1\,6\,\frac{2}{3}}$ or 33·93 sq. poles. Ans.

3. If a wheel is 9·147 feet in circumference, how many turns will it make in travelling 45·670971 miles?

Miles.
45·670971
5280 ft. in a mile.
3653677680
91341942
228354855
241142·726880 = distance in feet to be travelled.

9·14700)241142·72688(26363·04 = No. of turns. Ans.
1829400
5820272
5488200
3320726
2744100
5766268
5488200
2780688
2744100
3658800
3658800
.....

26,363·04 times. Ans.

4. Two horses and a carriage are worth £210, the carriage being worth $\frac{8}{9}$ of $\frac{3}{4}$ of this amount; find value of each horse, supposing one to be worth one-fourth as much again as the other.

Cost of carriage $= \frac{8}{9} \times \frac{\overset{4}{\cancel{3}}}{\underset{7}{\cancel{2\,8}}} \times \frac{\overset{30}{\cancel{2\,1\,0}}}{1}$ £ = £120.

∴ Horses cost £210 − £120 = £90.
One horse cost one-fourth as much again as the other;
∴ One horse cost $\frac{5}{9}$ of £90 = 10 × 5 = £50. Ans.
∴ Other horse cost $\frac{4}{9}$ of £90 = 10 × 4 = £40. Ans.

£50 and £40. Ans.

### FEMALES.

1. Find by practice the cost of 288 articles at £1 19s. 11½d. each.

| | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| | 288 | 0 | 0 | cost at | 1 | 0 | 0 |
| 10s. = ½ of £1 | 144 | 0 | 0 | ,, | 0 | 10 | 0 |
| 5s. = ½ ,, 10s. | 72 | 0 | 0 | ,, | 0 | 5 | 0 |
| 4s. = ¼ ,, £1 | 57 | 12 | 0 | ,, | 0 | 4 | 0 |
| 6d. = ½ ,, 4s. | 7 | 4 | 0 | ,, | 0 | 0 | 6 |
| 3d. = ½ ,, 6d. | 3 | 12 | 0 | ,, | 0 | 0 | 3 |
| 2d. = ⅓ ,, 6d. | 2 | 8 | 0 | ,, | 0 | 0 | 2 |
| ½d. = ¼ ,, 2d. | 0 | 12 | 0 | ,, | 0 | 0 | 0½ |
| | £575 | 8 | 0 | cost at | £1 | 19 | 11½ |

£575 8s. Ans.

2. How much would the paving of a street 2 m. 20 poles in length cost at £72 14s. per furlong?

| m. | p. | £ | s. | d. | | | |
|---|---|---|---|---|---|---|---|
| 2 | 20 at | 72 | 14 | 0 | per fur. | | |
| 8 | | | | 2 | | | |
| 10 | fur. | 145 | 8 | 0 | | | |
| | | | | 8 | | m. | p. |
| pls. | fur. | 1163 | 4 | 0 | cost of | 2 | 0 |
| 20 = ½ of 1 | | 36 | 7 | 0 | ,, | 0 | 20 |
| | | £1199 | 11 | 0 | ,, | 2 | 20 |

£1199 11s. 0d. Ans.

3. A grocer wishes to make up equal quantities of tea in 4, 5, 6, 7, 9, 12, 15, 20, 25, and 35lb. parcels; what is the smallest quantity which will allow him to do this?

4, 5, 6, 7, 9, 12, 15, 20, 25, 35
5 | 9, 12, 15, 20, 25, 35
3 | 9, 12, 3, 4, 5, 7
3, 4, 5, 7

$= 5 \times 3 \times 3 \times 4 \times 5 \times 7 = 6300$. Ans.

4. Mr. J. Hughes.

Bought of L. M. Boucher.

*March*, 1885.

| | | | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| (1) | 6 yds. of silk | at | 8 | 4½ | per yard | 2 | 10 | 1½ |
| (2) | 27 ,, | muslin | ,, 2 | 10½ | ,, | 3 | 18 | 2½ |
| (3) | 4½ ,, | calico | ,, 0 | 11 | ,, | 0 | 4 | 1½ |
| (4) | 6⅝ ,, | linen | ,, 0 | 10½ | ,, | 0 | 5 | 10 |
| (5) | ½ grs. of buttons | | ,, 1 | 1½ | per doz. | 0 | 6 | 7½ |
| (6) | 2 yds. of satin | | ,, 4 | 7½ | per yd. | 0 | 9 | 3½ |
| | | Total | | | | £7 | 14 | 2½ |

Received the same time. £7 14s. 2½d.

J. H., for L. M. Boucher.

## Grammar.

1. Parse the sentence:—

'Great is he who uses his greatness for all.'

*Great*—adj. of qual., pos. deg., qual. 'he.'
*is*—irreg. int. verb, ind. mood, pres. tense, 3rd per., sin. num., agreeing with its nom. 'he.'
*he*—per. pro., mas. gen., 3rd per., sin. num., nom. case to 'is.'
*who*—rel. pro., mas. gen., 3rd per., sin. num., agreeing with its antecedent 'he,' nom. case to 'uses.'
*uses*—reg. tran. verb., act. voice, ind. mood, pres. tense, 3rd per., sin. num., agreeing with nom. 'who.'
*his*—poss. adj. pro., mas. gen, 3rd. per., sin. num., qual. 'greatness.'
*greatness*—abs. noun, neu. gen., sin. num., obj. case, gov. by 'uses.'
*for*—prep., showing relation between 'uses' and 'all.'
*all*—numeral adj., qual. (people), or indef. adj. pro., obj. case, gov. by 'for.'

Analyse the following passage:—

'It was a summer's evening;
Old Kaspar's work was done,
And he before his cottage door
Was sitting in the sun;
And by him sported on the green
His little grandchild—Wilhelmine.'

ANALYSIS.

| Sentence. | Kind of Sentence. | Connective. | Subject. | Predicate. | Object. | Extension. |
|---|---|---|---|---|---|---|
| (1) It was a summer's evening | Principal Sent. | | it | was a summer's evening | | |
| (2) Old Kaspar's work was done | Principal Sent. | | old Kaspar's work | was done | | |
| (3) And he before his cottage door was sitting in the sun. | Principal Sent. (co-or. to 2) | And | he | was sitting | | before his cottage door in the sun (place) |
| (4) And by him sported on the green his little grandchild, Wilhelmine. | Principal Sent. (co-or. to 2 and 3) | And | his little grandchild Wilhelmine | sported | | by him on the green (place) |

2. What do you mean by the infinitive mood? Give examples of its various uses.

The *infinitive mood* (exp. root, Latin, *infinitus, in, finitus*, unbounded) is that form of the verb which denotes an action unlimited as regards person and number, and is generally known by the sign '*to*' which precedes it.

(1) It is used after auxiliaries.
*e.g.*, I can go;
,, He should go.
(2) As a noun to form subject or object.
*e.g.*, To return was unwise;
,, He longed to remain.
(3) To express purpose.
*e.g.*, He stood up to read;
,, They went away to catch fish.
(4) To qualify nouns or adjectives.
*e.g.*, We have a house to dwell in;
,, He is ready to forgive.
(5) After verbs—
*Make, dare, bid, feel, hear, see*, and *let*, without the sign '*to*.'

3. Write six English nouns, six adverbs, and six adjectives formed from roots or primary words by means of affixes. Distinguish between affix and the root.

| *Nouns.* | *Adjectives.* | *Adverbs.* |
|---|---|---|
| king-dom | whit-ish | month-ly |
| lamb-kin | north-ern | quick-ly |
| hill-ock | four-fold | side-ways |
| public-an | wood-en | head-long |
| sing-er | child-like | heaven-wards |
| court-ship | grace-ful | like-wise |

## Geography.

1. Draw a map of the Eastern part of Australia.

2. Name the rivers of Scotland, and give a description of two which you think the most important.

RIVERS OF SCOTLAND.

| | |
|---|---|
| Tweed, Haddington, Tyne, Forth, Leven, Eden, Earn, Tay, South Esk, North Esk, Dee, Don, Yethan, Doveran, Spey, Findhorn, and the Ness. | Flowing east into the German Ocean. |
| Stinchar, Doon, Ayr, Irving, Clyde, and the Awe. | Flowing west into the Atlantic Ocean. |
| Esk, Annan, Nith, Dee, and the Cree. | Flowing south into the Solway Firth. |
| Thurso Water, Beauly, and the Naver. | North into the Atlantic Ocean. |

The two most important are the Clyde and the Tay.

*The Clyde* is the only large Scottish river flowing west. It rises in the Lowther Hills in South Lanarkshire, flows N. and N.W. through Lanark and between Dumbarton and Renfrew into the Atlantic Ocean. Its mouth is a wide estuary, in which are several islands, chief of which are Arran and Bute. It has no tributaries of importance. The navigation of the river is impeded by waterfalls. The chief towns on its banks are Lanark, Hamilton, with the residence of the Duke of Hamilton, Glasgow (488,000), the largest Scottish town and the third sea-port in Great Britain, noted for its ship-building yards; Port Glasgow, Renfrew, Greenock, and Dumbarton, all large ports with great trade.

*The Tay* rises in the centre of Perthshire, flows N.E., S., and E., and enters the North Sea by a wide estuary, the 'Firth of Tay.' Its length is 110 miles, the longest Scottish river. Its tributaries on the right bank are the Almond and Earn, and on the left the Garry, Tummel, and Isla. It is a Perthshire river, its whole course, except the Firth, being in that county. The valley which it flows through is noted for its fine scenery. The river abounds in salmon. The chief towns on its banks are Perth, 'the fair city' near to its mouth, and Dundee, in Forfarshire, on the Firth of Tay, the third town in Scotland, a great linen centre. Near the last town the river is crossed by a splendid bridge, part of which was destroyed (December, 1879).

3. What are the chief productions and exports of the various divisions of Australia?

*Queensland* produces wool, cotton, indigo, tobacco, rice, arrowroot, and maize. Its chief mineral production is gold. Its exports are wool, gold, tallow, hides, and potted meats.

*New South Wales* produces wool, coal, gold, and tin. More sheep are reared in this colony than in all the other Australian colonies put together. The richest coal-bed in the world lies around Newcastle. Corn and the vine are cultivated. Its chief exports are wool, gold, coal, tallow, and preserved meats.

*Victoria's* gold mines are well known all over the world. This gold is found in the beds of old rivers. Cattle and sheep are extensively reared. Wheat, barley, oats, and potatoes and the vine are cultivated. It exports gold, wool, cattle and hides.

*South Australia* is rich in minerals; copper, lead, tin, etc. Copper is found in large quantities at Burra-burra. It also grows large quantities of wheat. Sheep are reared. It exports wheat and copper.

*West Australia* does not produce or export much owing to its very scanty population. Sheep are reared. Minerals are found Fruit is extensively cultivated, but not sold owing to the want of markets. Wool, copper, pearl-shells, and timber are exported.

## History.

1. Explain briefly the following terms:—Bretwalda, Druids, Heptarchy, Adrian's Wall, Foss Way, Watling Street, Danegelt.

*Bretwalda.*—During the Saxon period the country was divided into many kingdoms, each ruled over by a separate king. The most powerful of these kings was called the Bretwalda, and he seems to have held authority over the others.

*Druids.*—The priests of the ancient Britons. Their headquarters were at Anglesey. They conducted the worship, performed all the rites, and offered sacrifices for the people. The chief Druid was the Arch-Druid. They also made poetry, were thought to be very wise, and were highly respected by the ancient Britons.

*Heptarchy* means seven governments. It was the name given to the kingdoms founded by the Angles, Saxons, and Jutes, under various leaders, between the years 449-582 A.D.

*Adrian's Wall.*—A wall built across Britain, from the Solway Firth to the mouth of the Tyne. The Picts and Scots frequently came down from Scotland to plunder and ravage the country. This led the Emperor Adrian to build this wall (121 A.D.).

*Foss Way.*—A Roman road, extending from Cornwall to Lincoln.

*Watling Street.*—Another Roman road, going from Kent to Carnarvon.

*Danegelt.*—A tax which was levied on the land by Ethelred the Unready, for the purpose of buying off the Danes. It was abolished by Edward the Confessor.

2. Give a short description of the dress, dwellings, weapons, food, and trade of the inhabitants of Britain at the time of the Roman invasion.

The Britons clad themselves in skins, leaving their limbs bare, on which they painted devices with blue, which they got from a plant called woad. Those who lived in Cantii were more civilised and wore coarse woollen stuffs and ornaments of gold and silver.

The northern tribes lived in caves and woods; the southern in rude dwellings grouped together and surrounded by a wooden palisade for a defence.

The tribes were frequently at war with each other. Their weapons were spears, daggers, swords made of bronze, and a kind of war-chariot, with long knives attached to the wheels, which committed frightful havoc in battle. The savages of the north lived on flesh of deer, cows, sheep, etc., and milk. They never tilled the ground.

The tribe of Cantii grew corn, and lived on flesh brought home by the hunter, and fish and milk.

They exported cheese, cattle, fish, chalk, lime, and oysters to Gaul, and received gold, silver, and other things in return.

3. Write a short account of the reign of Edward the Confessor.

Edward was the son of Ethelred the Unready and Emma. He began to reign 1042 A.D. Earl Godwin, his father-in-law, was the means of his getting the crown. Having spent nearly thirty years in Normandy while the Danish kings were reigning in England, he had got so accustomed to Norman manners and customs, that he chose Norman favourites, and appointed them to high offices. This displeased his subjects and led to disputes. Earl Godwin fled to Flanders, but returned and died afterwards. His son Harold succeeded to his earldom (1053). The Duke of Northumberland replaced Malcolm on the throne of Scotland.

His father Duncan had been slain by Macbeth. Edward was for a long time engaged with those holy works, for which cause people called him 'the Confessor.' The Duke of Normandy visited the king, and, it is said, Edward promised to make him his heir.

The two chief things Edward did for his subjects were abolishing Danegelt and restoring the old laws.

He died in 1066, and was buried in Westminster Abbey.

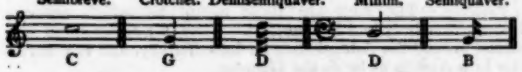
### Music.

*A quarter of an hour allowed for this paper.*

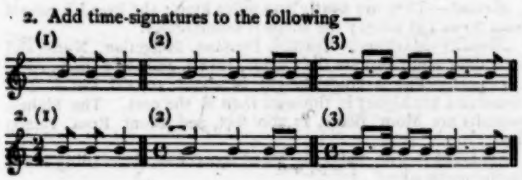
(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. Write above each of the following notes its value-name, and below each its pitch-name :—

1. (1) Semibreve. (2) Crotchet. (3) Demisemiquaver. (4) Minim. (5) Semiquaver.




2. Add time-signatures to the following—




3. Write below each of the following intervals its name :—

### TONIC SOL-FA NOTATION.

1. Write the names of the following intervals :—(1) *te* to *doh*$^1$; (2) *soh* to *ray*$^1$; (3) *doh*$^1$ to *fah*$^1$.

1. (1) Minor second; (2) perfect fifth; (3) Perfect fourth.

2. Write (1) a six-pulse tone using three-pulse measure; and (2) a six-pulse tone using two-pulse measure.

(1) |l :— :— |— :— :— ‖

2. (2) |l :— |— :— |— :— ‖

3. What is meant by "Key G"? Write the following an octave higher :—

|s, :d :r |f :l :s |t, :d, :d ‖

3. By "Key G" we mean that the *doh* of a piece must be pitched from Key G.

|s :d' :r' |f' :l' :s' |t :d :d' ‖

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## SECOND YEAR.

### Pupil Teachers at end of Second Year.

### FIRST PAPER.

*Three hours and a half allowed.*

### Euclid.

MALES.

1. To describe a triangle whose sides shall be equal to three given straight lines, but any two of which must be together greater than the third.

Why is it necessary to add the last clause?

Euclid, Book I., Prop. 22.

In Prop. 20 we are told that any two sides of a triangle must be together greater than the third side, thereby proving that there cannot be two sides less than the third.

2. If two angles of a triangle be equal to one another, the sides also which subtend or are opposite to the equal angles are equal to one another.

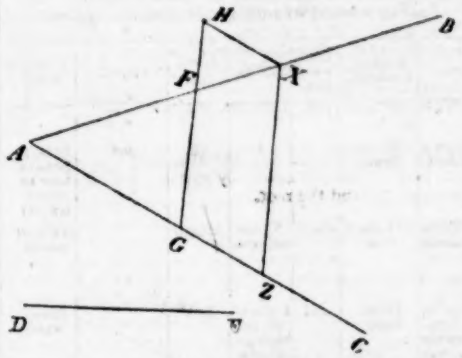
Of what proposition is this the converse?

Euclid, Book I., Prop. 6.

This proposition is the converse of Prop. 5 (1st part). That which was proved in the 5th is the hypothesis of the 6th.

3. Place a straight line of given length between two straight lines which meet, so that it shall be equally inclined to each of them.

Let BA, AC be two straight lines which meet in A, and DE a given straight line. It is required to place DE between BA, AC so that it shall be equally inclined to each of them. In AB take any point F.




From AC cut off AG = AF. Join GF. If GF is = to DE, that which was required is now done; if not, produce GF to H, so that GH shall be = to DE. Through H draw HX parallel to GC. Through X draw XZ parallel to HG (I. 31). XZ is the line placed as required. Because HGZX is a parallelogram, side HG = XZ; ∴ XZ = DE. Again, because ∠ AFG = ∠ AGF; it may be proved that ∠ FXZ = ∠ XZG, ∴ the straight line XZ is equally inclined between BA, AC. Q. E. F.

### Arithmetic.

FEMALES.

1. What is the value of $\frac{3}{4}$ of 2 guineas + $\frac{7}{8}$ of 3s. 4d. + $1\frac{1}{2}$ of half a sov. + $\frac{4}{15}$ of 3s. 9d. + $\frac{10\frac{1}{2}}{12}$ of a groat?

| | | £ | s. | d. |
|---|---|---|---|---|
| $\frac{3}{4}$ of 2 guin. | = 36s. | = 1 | 16 | 0 |
| $\frac{7}{8}$ of 3s. 4d. | = 35d. | = 0 | 2 | 11 |
| $1\frac{1}{2}$ of 10s. | $= \frac{14 \times 10}{9} = 15\frac{5}{9}$s. | = 0 | 15 | $6\frac{2}{3}$ |
| $\frac{4}{15}$ of 3s. 9d. | = 12d. | = 0 | 1 | 0 |
| $\frac{10\frac{1}{2}}{12}$ of 4d. | = $\frac{7}{8}$d. | = 0 | 0 | $3\frac{1}{2}$ |
| | | £2 | 15 | $9\frac{1}{2}$ Ans. |

2. A tea-dealer having $\frac{3}{4}$ of 2 cwt. $9\frac{1}{2}$ lbs. of tea, sold at different times $\frac{1}{15}$ cwt., $\frac{4}{15}$ qr., $\frac{1}{2}$ of 3 qr., $\frac{1}{140}$ ton, $\frac{2}{3}$ of $\frac{1}{2}$ cwt., and $\frac{2}{3}$ of $\frac{7}{15}$ of $\frac{75\frac{3}{4}}{112}$ cwt. What quantity had he left?

| | |
|---|---|
| $\frac{3}{4}$ of 2 cwt. $9\frac{1}{2}$ lbs. | = 100 lbs. |
| $\frac{1}{15}$ of 1 cwt. = $\frac{1}{4}$ qr. | = 7 lbs. |
| $\frac{4}{15}$ qr. | = 10 ,, |
| $\frac{1}{2}$ of 3 qrs. | = 14 ,, |
| $\frac{1}{140}$ of a ton | = 14 ,, |
| $\frac{2}{3}$ of $\frac{1}{2}$ cwt. | = 21 ,, |
| $\frac{2}{3}$ of $\frac{7}{15}$ of $\frac{75\frac{3}{4}}{112}$ cwt. | = 18 ,, |
| | 84 lbs. |

lbs. lbs.
100 − 84 = 16 lbs. Ans.

3. Express as decimals : $\frac{1295}{10000}$, $\frac{27}{1000}$, $\frac{16}{10}$, $\frac{1075}{333}$, $\frac{1}{63}$.

| | |
|---|---|
| 1295 ÷ 10000 = | ·1295. Ans. |
| 27 ÷ 1000 = | ·027. ,, |
| 16 ÷ 10 = | 1·6. ,, |
| 1075 ÷ 333 = | 3·228 ,, |
| 1 ÷ 63 = | ·015873 ,, |

4. What number is that of which 76 is $\frac{4}{5}$, and what fraction is that of which $\frac{4}{5}$ is $\frac{3}{4}$?

$\frac{4}{5} : \frac{4}{5} :: 76 : \underline{95}$. Ans.

$\frac{3}{4} : \frac{4}{5} :: \frac{4}{5} : \underline{\frac{16}{15}}$. Ans.

## Grammar.

### MALES AND FEMALES.

1. Analyse fully :—

*Even* now *where* Alpine solitudes ascend,
I sit *me* down, a pensive *hour to spend;*
And *placed* on *high* above the storm's career
*Look* downward where a hundred realms *appear.*

| Sentence. | Kind of Sentence. | Con. nective. | Subject. | Predicate. | Object. | Extension. |
|---|---|---|---|---|---|---|
| (*a*) | | | | | | |
| I sit me down a pensive hour to spend. | Princ. Sent. | | I | sit | me | down a pensive hour to spend (cause) |
| (*b*) | | | | | | |
| Where Alpine solitudes ascend even now. | Adv. Sent. to *a*. | where | Alpine solitudes | ascend | | even now (time) |
| (*c*) | | | | | | |
| And I, placed on (a) high (position) above the storm's career look downwa d | Princ. Sent. | and | I, placed on (a) high (position) above the storm's career. | look | | down-ward |
| (*d*) | | | | | | |
| Where a hundred realms appear. | Adv. Sent. | where | a hundred realms. | appear | | |

2. Parse the words in italics, paying special attention to the syntax.

*Even* (*now*)—an adv. phrase, mod. *ascend.*
*where*—an adv. conj., joining the sents. 'I sit me down' and 'Alpine solitudes ascend.'
*me*—pers. pro., 1st pers., sing. num., com. gen., obj. case, gov. by *sit*, used reflectively for *myself.*
*hour*—com. noun, 3rd pers., sing. num., neut. gen., nom. case, gov. verb *to spend.*
*to*—a particle, indicating infin. mood.
*to spend*—a reg. intrans. verb, inf. mood, governed by *sit.*
*placed*—a past partic., from the trans. verb to *place*, referring to *I.*
*high*—adj. of qual., pos. deg., qualifying *position* (und.).
*look*—reg. act. intrans. verb, ind. mood, pres. tense, 1st pers., sing. num., agree with its nom. *I* (und.)
*appear*—reg. act. intrans. verb, ind. mood, pres. tense, 3rd pers., plur. num., agree with *its* nom. *realms.*

3. Give the meaning of the following prefixes, with three examples of the use of each :—

Trans, ultra, retro, in (with verb), ex, semi, subter.

*Trans*—across, as *trans*port, *trans*cribe, *trans*atlantic.
*ultra*—beyond, as *ultra*marine, *ultra*montane, *ultra*mundane.
*retro*—backward, as *retro*spect, *retro*grade, *retro*gression.
*in*—into, as *in*vade, *in*duce, *in*herit.
*ex*—out of, as *ex*port, *ex*pand, *ex*pose.
*semi*—half, as *semi*quaver, *semi*circle, *semi*breve.
*subter*—beneath, as *subter*fuge, *subter*fluent.

4. Paraphrase :—

A time there was ere England's griefs began,
When every rood of ground maintained its man:
For him light labour spread her wholesome store,
Just gave what life required, but gave no more.

At one period before England began to suffer from the accumulation of wealth, every peasant cultivated a small portion of land for himself. He bestowed easy, yet industrious work on it. In return, it supplied him with nourishing food, just enough for the necessities of life, but nothing to store up for future use.

## Geography.

1. Say what you can of (1) the Deccan, (2) the Alps.

THE DECCAN.—The Deccan is an extensive tableland in the form of a triangle. It is bounded on the north by the Vindhya Mountains; on the east by the Eastern Ghauts; on the west by the Western Ghauts; and on the south by the Neilgherry Hills. The Deccan has a general slope from west to east: it is about 3,000 feet high, and the surface consists of treeless plains, which are intercepted by low rocky ridges; here and there are insulated, round-topped hills, some of which are fortified. It contains also a great extent of jungle.

*Rivers.*—The chief rivers which rise in the Deccan are Godavery, Krishna, and Cauvery, flowing east.

*Towns.*—Hyderabad, capital of Nizam's dominions: Golconda has famous diamond fields; Aurungabad, Nagpore, Bellary, Bangalore, and Ellora, noted for its cave-temples.

*Products.*—Cotton, wheat, vegetable oils and dates.

### THE ALPS.

*Position.*—The Alps are those mountains which separate France from Italy and Switzerland. They fill Switzerland and extend around the Adriatic Sea far into Turkey, and run north-east into Austria as far as the Danube.

*Extent.*—They are nearly 700 miles long; the breadth ranges from 80 to 130 miles; the shape is semicircular.

*Names.*—Maritime, Cottian, Pennine, Helvetian, Noric, and extending south-east are the Carnic, Julian, and the Dinaric Alps.

*Height.*—The average height is about 10,000 feet. The mountains are higher in the west than in the east. The highest summits are Mont Blanc, 15,700 feet, and Mont Rosa, 15,200 feet.

*Snowline.*—The height is about 8,000 feet, descending lower on the north side.

*Glaciers.*—There are about 400 glaciers; some are about 20 miles long. A glacier is a river of ice.

*Avalanches.*—These are formed by large masses of ice and snow which break off from the glacier, and roll down the mountain side, getting larger and larger. They make a thundering noise which can be heard far away, and destroy villages and even towns before the inhabitants have time to escape.

*Passes.*—These are very high. The chief are—Mont Cenis, 6,670 feet; Great St. Bernard, 8,170 feet; Cervin, 1,100 feet; great road of Simplon, 6,588 feet, constructed by Napoleon. The Splugen, famous in the history of Napoleon. Mont Cenis is now tunnelled.

*Valleys.*—Warm and fertile.

*Rivers.*—Rhone, flowing south-west through France; Po, in Italy, flowing east; Rhine, flowing north-west; and the Danube, flowing east.

*Lakes.*—These are deep, blue, and large, with beautiful scenery. On the north side they belong to Switzerland, and on the south to Italy.

*Minerals.*—The central and higher Alps are deficient in metals. Lead and quicksilver are found in the east.

*Remarks.*—Alpine scenery is grand and picturesque. The inhabitants are hardy, patriotic, and noted for the way in which they have defended their liberty.

2. Draw a map of Italy.

3. What are *latitude* and *longitude?* Say from what places they are reckoned, and, if you can, how they are calculated.

*Latitude* is the distance north or south of the equator. All nations reckon the parallels of latitude from the equator. The northern and southern hemispheres are divided into 90 equal parts by lines parallel to the equator: each of these parts is called a degree, and measures 60 geographical or 69½ English miles. Furthermore, each degree is divided into 60 minutes, measuring one geographical mile, and every minute is divided into 60 seconds.

For the sake of convenience, geographers divide the equatorial circle into 360 degrees (°), and the lines drawn through each of these parts to the north and south poles form the meridians of *Longitude.* They are not like lines of latitude, because they have no fixed starting-point. Nearly every nation measures its lines of longitude from a different point. In England we take a line running through Greenwich, and measure east and west of that.

*Latitude* may be calculated by viewing the North Pole Star, which, if you were at the North Pole would be exactly over your head, and as you passed on towards the equator, it would appear to descend in the heavens just as many degrees as we passed over the curved surface of the earth.

*Longitude* is found by chronometers, which give the exact time at Greenwich. Noon at any place is the time the sun crosses its meridian. Thus, if the sun crosses the meridian at 12 30, we know that the longitude is 7½ degrees west of Greenwich, as the sun passes 360 degrees in 24 hours.

## SECOND PAPER.

*Two hours and a half allowed.*

### Needlework.

FEMALES.

(One hour allowed for the Exercise in Needlework.)

### Arithmetic.

MALES.

1. What sum of money will amount to £350 19s. 4½d. in 6½ years at 4½ per cent. per annum?

$6\frac{1}{2} \times 4\frac{1}{2} = \frac{13}{2} \times \frac{17}{4} = \frac{221}{8} = 27\frac{5}{8}$.

As $127\frac{5}{8}$ : 100 :: £$350\frac{9}{12}$

$$\frac{\overset{25}{\cancel{100}} \times \overset{1}{\cancel{8}} \times \overset{11}{\cancel{1417}}}{\underset{4}{\cancel{1017}} \times \underset{17}{\cancel{34}}} = \underline{£275.} \quad \text{Ans.}$$

2. Work as a compound proportion question the following:—Find the interest of £500 for 3¼ years at 2½ per cent. per annum.

100 : 500 :: 2½ p.c.

1 : 3¼

$$\frac{\overset{5}{\cancel{100}} \times 13 \times 5}{4 \times \underset{2}{\cancel{100}} \times 2} = \underline{£40\ 12s.\ 6d.} \quad \text{Ans.}$$

3. A bill of £999 is due in such a time that £80 would in the same time amount to £83½. What discount should be allowed for ready money?

As 83½ : 80 :: £999

$$\frac{80 \times 4 \times \overset{3}{\cancel{999}}}{\cancel{333}} = \underline{£960.}$$

999 − 960 = £39. Ans.

4. A newspaper boy buys papers at 9d. per dozen, getting thirteen to the dozen. If he sells them at a penny each, what is his gain per cent.?

Buying price = 9d. for 13.

Selling price = 1d. each.

∴ he gains 4d. on 9d.

As 9 : 100 :: 4 : $x$.

$$\frac{100 \times 4}{9} = 44\frac{4}{9} = \underline{44\frac{4}{9}\ \text{p. c.}} \quad \text{Ans.}$$

### History.

1. What changes were effected in the condition of the English people after the Norman Conquest?

The chief changes were:—

(1) The substitution of the Norman for the Saxon line of kings.

(2) The introduction of Norman laws. The English laws were done away with, and the Normans introduced their laws.

(3) The introduction of the Feudal System, by which the king held all the land; he then divided it among his Norman followers, on condition of rendering military service.

(4) The subjection of the Saxons to the Normans. The English before the Norman Conquest owned the land, but when the Normans came they (the English) were treated with great severity and were made slaves.

(5) The introduction of the Norman language. Before this the Saxon language was spoken by the rich and poor, but now the higher classes spoke the Norman language.

(6) An enlarged intercourse with the Continent, resulting in the increase of commerce and a higher degree of civilisation in England.

2. What were the causes which led to the signing of Magna Charta? Name its chief provisions, and say whether they are or are not still in force.

The chief causes which led to the signing of the Magna Charta were:—

(1) The tyranny of King John.

(2) Conferring the chief offices of state upon foreign favourites.

(3) His loss of Continental provinces.

(4) His abject submission to the Pope.

(5) The bold determination of the barons to resist the tyranny and cowardice of John.

The chief provisions contained in the Magna Charta were:—

(1) That the Church should be free.

(2) That no tax or aid should be imposed but by the great council of the nation, except in cases of the king's captivity, knighting of his eldest son, and the marrying of his eldest daughter.

(3) That the king should not seize any baron's land for a debt to the crown, if the baron has enough goods to pay the debt.

(4) That the privileges granted to the barons by the king should be extended by the barons to the vassals.

(5) That one weight and one measure should be used throughout the kingdom.

(6) That there should be free liberty to merchants to transact business, and that all freemen should have liberty to enter and leave the kingdom at pleasure.

(7) That London and all the cities should preserve all their ancient liberties and free customs.

(8) That the goods of every freeman shall be disposed according to his will; if he die intestate his heirs shall succeed to them.

(9) That the king's courts should no longer follow his person, but be open to every one, and justice should no longer be refused, sold, or delayed by them.

(10) That no freeman shall be imprisoned, banished, or in any way hurt but by the law of the land.

(11) That a freeman shall be fined according to his fault, and no fine shall be put on him to his utter ruin.

(12) That no villein or rustic shall be deprived by any fine of implements of industry.

The provisions of the Magna Charta are still in force, with a few exceptions, and form the basis of English liberty. The enactments not in force are those which the fall of the Feudal System renders void.

3. What important geographical and other discoveries were made in the Tudor period?

TUDOR PERIOD, 1485-1603.

(1) Christopher Columbus discovered the Bahama Isles in the West Indies in 1492.

(2) Sebastian Cabot discovered Newfoundland in 1497.

(3) Christopher Columbus discovered America in 1498.

(4) Vasco de Gama discovered the passage round the Cape of Good Hope to India, 1497 to 1498.

(5) Sir Francis Drake sailed round the world and made many important discoveries.

(6) Sir Walter Raleigh brought hops, potatoes, and tobacco from America.

(7) Sir Martin Frobisher explored in the Arctic regions.

(8) William Caxton, the first great English printer, printed over sixty works. He died in 1491.

(9) In 1589 a frame for weaving silk stockings was invented by the Rev. W. Lee, of Cambridge. This gave an impulse to the manufacture in England.

(10) In 1590 the first paper-mill was erected at Dartford, in Kent.

### Teaching.

Name the common faults you have met with in the writing of your class, and say how you have corrected them.

The chief difficulties I have to contend with in teaching writing are:—

To get the children to sit in a proper posture, and hold their pens right. Some children get their second finger covered with ink. I make these children hold their pens farther from the point. These difficulties being got over, I try to make them write as legibly as possible; I discourage a much-sloping style, as it is indistinct. It is very difficult to get the children to observe the right proportion between the height, width, and thickness of the letters. I do this by means of a ruled blackboard. I explain each letter, especially those with loops and tails. In regard to thickness, the lines may be too light, which makes a 'scratch' hand, or they may be too thick, which makes a 'heavy' hand. Sometimes it is difficult to get the children to join their letters properly. Joining 'o' with 'a' is a common mistake. Sometimes the children make what I call 'cracked o's,' and often they do not leave sufficient room between the letters and words. To remedy this I try to get them to write their words by one continuous motion of the hand, instead of stopping to dot an *i* or stroke a *t* in the middle of a word.

## Music.

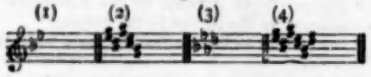
### OLD NOTATION.

*A quarter of an hour allowed for this paper.*

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

1. Write the key-signature of the following major keys:—(1) B♭; (2) B; (3) A♭; (4) F♯.

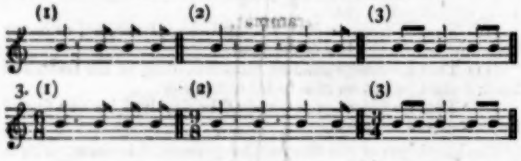
1. (1) (2) (3) (4)



2. Write below each of the following intervals its name (major third, &c.):—

2. (1) (2) (3)

3. Add time-signatures to each of the following:




### TONIC SOL-FA NOTATION.

1. Write the names of the following intervals:—(1) *lah* to *fah*'; (2) *te* to *soh*'; (3) *te* to *ray*'.

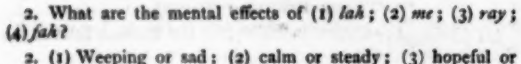
1. (1) Minor sixth; (2) minor sixth; (3) minor third.

2. What are the mental effects of (1) *lah*; (2) *me*; (3) *ray*; (4) *fah*?

2. (1) Weeping or sad; (2) calm or steady; (3) hopeful or rousing; (4) desolate or awe-inspiring.

3. Write a short exercise in six-pulse measure.

3.




## THIRD YEAR.

### Pupil Teachers at end of Third Year.

### FIRST PAPER.

*Three hours and a half allowed.*

(All generally understood abbreviations for words may be used.)

### Euclid.

MALES.

1. If a straight line falling on two straight lines make the alternate angles equal to one another, the two straight lines shall be parallel to one another.

Explain Alternate Angles, Problem, Theorem.

Euclid, Book I., Prop. 29.

Alternate angles are so called when a straight line meets other straight lines, the angle which the straight line makes with the first being alternate with the angle which it makes with the other on the opposite side.

A problem is a question which requires a solution.

A theorem is a truth which is established by demonstration.

2. To describe a square on a given finite straight line.

Euclid, Book I., Prop. 48.

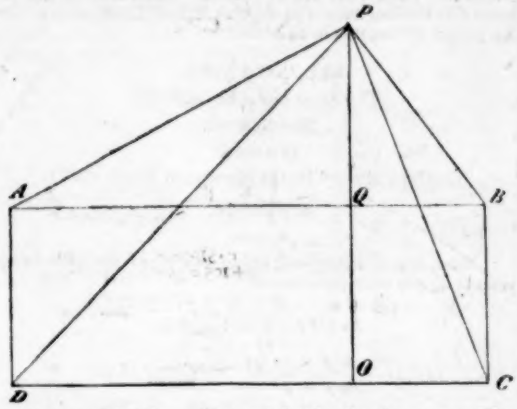
3. If any point P be joined to A, B, C, D, the angular points of a rectangle, show that the squares on PA and PC are equal to the squares on PB and PD.

Let P, the given point, be outside (1st case); through P draw PQO parallel to BC or AD. (I. 31.)

It is required to prove that the square AP and square PC= square PB and square PD.

Because the angles at B and C (Hypo.) are right angles; and PO is drawn parallel to BC, the angles at Q and O are each right angles.

Then because AQP is a right-angled triangle, the square AP =square AQ together with square PQ. (I. 47.)




Because POC is a right-angled triangle, the square CP= square PO together with square OC. (I. 47.)

∴ the square AP together with square PC=square AQ together square PQ and square PO and square OC (Ax. 2.)

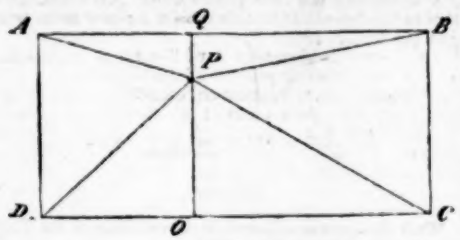
Again, because PQB is a right-angle; square PB=square PQ together with square QB. (I. 47.)

Again, because POD is a right-angle; square PD=square DO together with square OP. (I. 47.)

Square PB together with square PD=square PQ together with square QB and square DO and square OP (Ax. 2); but square PA together with square PC=square AQ together with square PQ and square PO and square OC; and in these expressions square PQ and square PO are common.

And QB=OC, because the opposite sides of a parallelogram are equal, and for the same reason AQ=DO. And their squares will be equal.

∴ squares on AP and PC are equal to squares on PB and PD. The same proof will apply if the point be inside. Q. E. D.




### Algebra.

1. Simplify:—

$\{2a-(3b+c-2d)\}-\{(2a-3b)+(c-2d)\}+\{2a-(3b+c)-2d\}-\{(2a-3b+c)-2d\}$.

$$\begin{aligned}
&\{2a-(3b+c-2d)\}-\{(2a-3b)+(c-2d)\}\\
&+\{2a-(3b+c)-2d\}-\{(2a-3b+c)-2d\}\\
&=\{2a-3b-c+2d\}-\{2a-3b+c-2d\}\\
&+\{2a-3b-c-2d\}-\{2a-3b+c-2d\}\\
&=\quad 2a-3b-c+2d\\
&\quad -2a+3b-c+2d\\
&\quad 2a-3b-c-2d\\
&\quad -2a+3b-c+2d\\
&\quad \underline{\qquad -4c+4d.}\quad \text{Ans.}
\end{aligned}$$

2. Give the rule for finding the G.C.M. of two or three quantities; and find the G.C.M. of

$x^4-2x^3+x^2-8x+8$, and $4x^3-12x^2+9x-1$.

When the G.C.M. of two quantities is required, set them down as for division, arranging them according to their descending powers; the one having the highest powers for the dividend. Divide; if there be no remainder the divisor itself is the G.C.M. If there be a remainder, divide the first divisor by it, and proceed until the terms are exhausted, making each successive remainder a divisor and each divisor a dividend. The last divisor is the G.C.M.

For three quantities, find the G.C.M. of two of them, by the above process and then find the G.C.M. of the third quantity and the G.C.M. of the first two.

In some cases the G.C.M. may be found by factors.

$x^4-2x^3+x^2-8x+8=(x^3-x^2-8)(x-1)$

$4x^3-12x^2+9x-1 \quad =(4x^2-8x+1)(x-1)$

$\therefore$ $x-1$ is the G.C.M.

3. Solve :—

(1) $\dfrac{x+4}{3x+5}+1\frac{1}{8}=\dfrac{3x+8}{2x+3}$.

(2) $\dfrac{x-4}{x-5}-\dfrac{x-5}{x-6}=\dfrac{x-7}{x-8}-\dfrac{x-8}{x-9}$.

(1) $\dfrac{x+4}{3x+5}+1\frac{1}{8}=\dfrac{3x+8}{2x+3}$

$\dfrac{6(x+4)(2x+3)+7(3x+5)(2x+3)}{6(3x+5)(2x+3}=\dfrac{6(3x+8)(3x+5)}{6(3x+5)(2x+3)}$

Clearing fractions we get

$6(2x^2+11x+12)+7(6x^2+19x+15)=6(9x^2+39x+40)$

$12x^2+66x+72+42x^2+133x+105=54x^2+234x+240$

Transposing

$12x^2+42x^2-54x^2+66x+133x-234x=-72-105+240$

$199x-234x=63$

$-35x=63$

$-x=\frac{63}{35}$

$x=-\frac{9}{5}$

$x=-1\frac{4}{5}$. Ans.

(2) $\dfrac{x-4}{x-5}-\dfrac{x-5}{x-6}=\dfrac{x-7}{x-8}-\dfrac{x-8}{x-9}$

$\dfrac{(x-4)(x-6)-(x-5)^2}{(x-5)(x-6)}=\dfrac{(x-7)(x-9)-(x-8)^2}{(x-8)(x-9)}$

$\dfrac{x^2-10x+24-x^2+10x-25}{x^2-11x+30}=\dfrac{x^2-16x+63-x^2+16x-64}{x^2-17x+72}$

$\dfrac{-1}{x^2-11x+30}=\dfrac{-1}{x^2-17x+72}$

$-1(x^2-17x+72)=-1(x^2-11x+30)$

$x^2-17x+72=x^2-11x+30$

Transposing $x^2-x^2-17x+11x=30-72$

$-6x=-42$

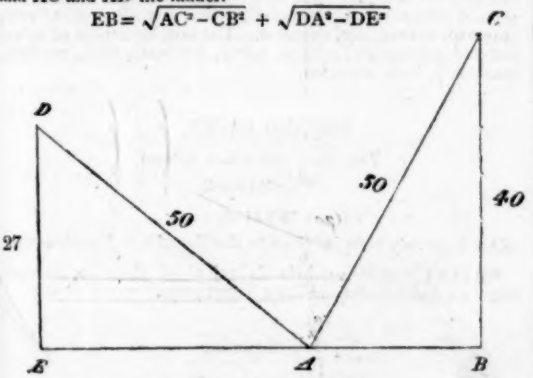
$x=7$

## Mensuration.

A ladder 50 feet long, with its foot in the street, will reach to the top of a building 40 feet high on one side, and to the top of another 27 feet high on the opposite side. Find the width of the street.

Let EB represent the street, C and D the tops of buildings, and AC and AD the ladder.

$EB=\sqrt{AC^2-CB^2}+\sqrt{DA^2-DE^2}$




$\therefore$ $EB=\sqrt{50^2-40^2}+\sqrt{50^2-27^2}$

$=\sqrt{2500-1600}+\sqrt{2500-729}$

$=\sqrt{900}+\sqrt{1771}$

$=30+42{\cdot}083$

$=72{\cdot}083$ ft. $=$ 24 yd. 0 ft. 0·996 in. Ans.

## Arithmetic.

FEMALES.

1. Add together 5·36 of £1 7s. 1d., 95·1725 of £2 18s. 4d., and ·0015625 of £39 6s. 8d.

| | £ | s. | d. |
|---|---|---|---|
| $\frac{536}{100}\times\frac{20}{1}$ | = 7 | 5 | 2 |
| $\frac{951725}{10000}\times\frac{720}{1}$ | =277 | 11 | $8\frac{3}{4}$ |
| $\frac{15625}{10000000}\times\frac{2340}{1}=\frac{585}{16}=$ | 1 | 2 | $\frac{1}{4}$ |
| | £284 | 18 | $1\frac{1}{4}$. Ans. |

2. If a man does ·008 of a piece of work in 3·2 hours, in how many more hours will he finish it?

(a) ·008 : 992 :: 3·2 hours : $x$

(b) $\dfrac{992\times3{\cdot}2}{{\cdot}008}=\dfrac{3{\cdot}1744}{{\cdot}008}=$

hrs. mins. dys. hrs. mins.

(c) 396 48 = 16 12 48. Ans.

3. If 5 tons 13 cwt. of coals cost £6 7s., what will 111 cwt. be worth?

Tons cwt. cwt.

(a) As 5 13 : 111 :: £6 7s. : $x$

cwt. cwt. s.

(b) 113 : 111 :: 127 : $x$

(c) $\dfrac{111\times127}{113}=\frac{14097}{113}=124\text{s. }9\frac{10}{113}\text{d.}=$ £6 4s. $9\frac{10}{113}$d. Ans.

4. Simplify :—

$$\frac{(\cdot75-\cdot61)(1{\cdot}6744+\cdot4256)}{\cdot428571\text{ of }1{\cdot}5}\div\frac{1{\cdot}4}{6{\cdot}4}$$

$$=\frac{(\frac{3}{4}-\frac{61}{100})(2{\cdot}1)}{\frac{3}{7}\times\frac{15}{10}}\times\frac{\frac{64}{10}}{\frac{14}{10}}$$

$$=\frac{\frac{9}{100}\times\frac{21}{10}}{\frac{9}{7}}\times\frac{32}{7}$$

$$=\frac{1}{100}\times\frac{21}{10}\times\frac{7}{9}\times\frac{32}{7}=\frac{2}{3}.$$ Ans.

## Grammar.

MALES AND FEMALES.

1. Paraphrase the following passage :—

*Ill* fares the land to hastening *ills* a *prey*,
Where wealth accumulates and men decay ;
Princes and lords *may flourish or* may fade ;
A breath can make them, as a breath *has made* ;
But a bold peasantry, their country's *pride*,
*When* once *destroyed*, *can* never *be supplied*.

The land which attracts our attention by the fact of its increasing wealth, while its countrymen gradually lose all those manly qualities we so much admire, stands in a very unenviable position. Gentlemen can be placed in high offices of State, and rise or sink in society at pleasure; but the real foundation of a country is the sturdy peasant, whose loss would be keenly felt and never remedied.

2. Analyse it fully.

ANALYSIS.

| Sentence. | Kind of Sentence. | Connective. | Subject. | Predicate. | Object. | Exten. of Pred. |
|---|---|---|---|---|---|---|
| (a) Ill fares the land to hastening ills a prey | Princ. Sent. | | The land a prey to hastening ills | fares | | Ill (mann't) |
| (b) Where wealth accumulates | Sub. Adj. to (a) | where | wealth | accumulates | | |
| (c) And men decay | Sub. Adj. to (a) co-ord. with (b) | and (where) | men | decay | | |
| (d) Princes and lords may flourish | Princ. Sent. | | princes and lords | may flourish | | |
| (e) Or may fade | Princ. Sent. co-ord with (d) | or | [they] | may fade | | |
| (f) A breath can make them | Princ. Sent. | | a breath | can make | them (D. O.) | |
| (g) As a breath has made | Sub. Adv. to (f) | as | a breath | has made | [them] | |
| (h) But a bold peasantry, their country's pride can never be supplied | Princ. Disj. co-ord. with (d') | but | a bold peasantry their country's pride | can be supplied | | never (time) |
| (i) When once destroyed | Adv. to h) | when | [they] | [are] destroyed | | once (time) |

3. Parse the words in italics, and state clearly how you may tell an adverb from a conjunction, with examples.

*Ill*—Adv. of man., mod. the verb 'fares.'
*ills*—abs. noun, plur. num., neut. gen., obj. case, gov. by the prep. 'to.'
*prey*—com. noun, 3rd per., sing. num., neut. gen., nom. case, after the verb. ('is').
*may*—aux. verb, 3rd per., plur. num., agree. with its subject 'princes and lords,' and indicating potent. mood.
*flourish*—princ. verb, in the infinitive.
*may flourish*—reg. intrans. verb, act. voice, pot. mood, future tense, 3rd per., plur. num., agree. with its subject 'princes and lords.'
*has*—aux. verb, 3rd per., sing. num., agree. with its subject 'breath,' and indicating per. tense.
*made*—prin. verb, complete participle.
*has made*—irreg. trans. verb, act. voice, indic. mood, perf. tense, 3rd per., sing. num., agree. with its subject 'breath.'
*pride*—com. noun, sing. num., neut. gen., in the nom. in app. with 'peasantry.'
*destroyed*—complete participle of the verb 'to destroy.'
*can*—aux. verb, 3rd per., sing. num., agree. with its subject 'peasantry,' and indicating pot. mood.
*be*—aux. verb, 3rd per., sing. num., agree. with its subject 'peasantry,' and indicating pass. voice.
*supplied*—princ. verb, complete participle.
*can be supplied*—reg. trans. verb, pass. voice, potent. mood, pres. tense, 3rd per., sing. num., agree. with its subject 'peasantry.'

If the word be movable to any other part of the sentence it is an adverb; but if it cannot be moved from the beginning of the sentence it introduces it is a conjunction.

As conjunctions: He came *where* I was. George left *when* we came.
As adverbs: *Where* were you? *When* are you going?

4. How can you distinguish English words from Latin or other foreign words?

Words which contain one or more of the following parts are of Saxon or O.E. origin.

Words undergoing vowel changes, as man, men; ride, rode; bless, bliss; come, came; lie, lay, etc., etc.

Pairs of words, as grass, graze; weave, woof; stick, stitch, etc.

Words with O.E. prefixes and affixes, as al-most, a-miss, over-do, up-wards, to-day, etc.; -ship -dom, etc.

Most monosyllables are of pure English origin, but there are some belonging to the classical elements, *e.g.*, strata, street.

The mode of spelling words is sometimes an indication, as *k*nee, *gl*ad, which, etc.

One of our great English writers once said: 'Use the words which you first learnt, the words that fell from your mother's lips, the words that bring up your childhood and home, and you will unconsciously speak in good Saxon.'

## Geography.

1. Draw a full map of the Nile basin.

2. Explain, as to an upper class, the causes of the monsoons, and state what phenomena attend the changes of the monsoons.

*Monsoons are periodical trade winds* which prevail chiefly in the Indian Ocean. When the sun is north of the Equator the continent of Asia becomes greatly heated, and a current of air sets in from the south-west. When the sun crosses to the south of the Equator, the continent of Asia loses a large portion of its heat, and the wind then blows from the north-east to the Equator. Hence, from April to October, the south-west monsoon prevails in the Indian Ocean, and is succeeded by the north-east monsoon, which blows from October to April. These periods nearly coincide with the presence of the sun north or south of the Equator—not exactly, however, because the influence of the sun is not felt at once to its fullest extent. The change of the monsoons is a period of strife between the two opposite air-currents, and is generally accompanied by fierce storms and hurricanes; quantities of rain also fall at this time. Monsoons occur in the Gulf of Guinea owing to the heating of the continent of Africa, and in other parts of the world where great masses of land are exposed to the intense heat of the sun.

3. Which are the most thickly-peopled countries of Asia? Give an account of the trade and the inhabitants of each.

Of the mainland of Asia *India and China* are the only fully-peopled industrious portions. The reason of this is that China has an indented coast-line, with estuaries and harbours, and both have long large navigable rivers and climates which, though not entirely good, are tolerable.

(*a*) *China—Inhabitants.*—The learned men are held in great honour, and occupy all the important offices of state. The notions of female beauty are very peculiar, small feet being objects of great admiration. The religion of the upper classes is that of Confucius, and that of the lower orders is a species of Buddhism. Of the national works of China the most remarkable is the Great Wall of China, on the northern frontier, built to repel the Tartars, 1,250 miles long, fifteen feet broad, and from fifteen to thirty feet high. The Grand Canal is 700 miles long, 200 feet broad at the surface, and is often from sixty to seventy feet deep. Rice, the principal food, is eaten with chop-sticks, requiring much art to use; pork is a favourite, but dogs' flesh is considered a delicacy, and even rats and mice are relished by the lower classes. Tea is drunk without cream or sugar, and a great luxury is the edible bird's-nests from Java. The people are very deceitful, and in their vanity call their country the 'Celestial Empire.' They are very skilful in carving ivory, but their paintings show no knowledge of perspective.

*Trade.*—The internal trade of China is immense; the external trade is comparatively small, and mostly in the hands of the English. The Chinese are very averse to holding communications with foreigners. The manufactures are of great importance; the principal are silk, porcelain, nankeen (a kind of cotton cloth). The exports are tea, raw silk, and silk goods, porcelain, rice, sugar, ivory, and other fancy articles, rhubarb. The imports are opium, raw cotton, English manufactured goods, edible bird's-nests, furs, ivory.

(*b*) *India—Inhabitants.*—This country is almost as densely peopled as China; it is inhabited by many different races speaking different languages. The majority of the population are Hindoos. The religion of the Hindoos is Brahminism. Buddhism is now confined to Ceylon. There are about 15,000,000 Mahometans. The European inhabitants are Christians. Christianity has made some progress among the Indian population. The Sikhs have a religion of their own. Parsees, or fire-worshippers, are numerous in Bombay.

*Commerce.*—Very important; chiefly with England; also with China, Persia, Arabia, and Central Asia. The manufactures are cotton goods, silk, ivory, carving. The exports are raw cotton, opium, dyes, indigo, rice, raw silk, coffee, wool, cashmere shawls, jute, saltpetre. The imports consist of manufactured goods from England, cotton, hardware, silks, woollens, machinery, beer, wine, tea.

## SECOND PAPER.

***Two hours and a half allowed.***

## Needlework.

### FEMALES.

(One hour only must be given to the Exercise in Needlework.)

Set in a triangular patch in flannel about three inches each way; on it darn ten rows as for a thin place.

## Arithmetic.

### MALES.

1. Find the square root of $\frac{4}{5}$, and prove that $\sqrt{5} \times \sqrt{5} = 5$.

$$\sqrt{\tfrac{4}{5}} = \sqrt{\tfrac{8}{10}} = \underline{.80442.} \text{ etc.}$$

$$\sqrt{5} \times \sqrt{5} = 5 = 2{\cdot}23606 \times 2{\cdot}23606 = 4{\cdot}9999643236$$
$$= \underline{5} \text{ approximately.} \quad \text{Ans.}$$

2. What fraction of £5 is the excess of $\frac{3}{5}$ of £2 over $(\frac{1}{2} - \frac{1}{3})$ of $\frac{1}{5}$ of £2 10s.?

$$\frac{\frac{3}{5} \text{ of } £2 - (\frac{1}{2} - \frac{1}{3}) \text{ of } \frac{1}{5} \text{ of } £2\frac{1}{2}}{£5} = \frac{£\frac{3}{5} - \frac{1}{6} \text{ of } \frac{2}{5} \text{ of } \frac{5}{2}£}{£5} = \frac{£\frac{3}{5} - \frac{1}{6}£}{£5}$$

$$\frac{£\frac{16-1}{30}}{£5} = \frac{1\frac{1}{2}}{1} = \underline{1\frac{1}{2}}. \quad \text{Ans.}$$

3. Explain what is meant by losing 2 per cent. on a transaction in stocks. Find the yearly income from £2,500 invested in 3 per cents. at 98½, brokerage to be reckoned.

For facility, the par of most stocks is 100; and if a man were to sell his £100 stock for £98, he would lose 2 per cent.
£98½, when brokerage is reckoned, becomes 98½.

If 98½ gives an income of £3,

Then 1 „ „ £$\frac{3}{98\frac{1}{2}}$;

Therefore £2,500 gives an income of

$$£\frac{3\times2500}{98\frac{1}{2}} = £\frac{7\times2500\times8}{789}$$

$$= £76 \text{ cs. } 10\tfrac{263}{263}\text{d.}$$

4. Divide 623 into three parts, so that the 1st : 2nd as 4 : 7, and the 2nd : 3rd as 3 : 8.

1st : 2nd = 4 : 7 = 12 : 21. Multiply each term by 3.
2nd : 3rd = 3 : 8 = 21 : 56;
∴ 1st : 2nd : 3rd = 12 : 21 : 56
12 + 21 + 56 = 89. No. of shares.

As 89 : 12 :: 623 : 84 1st;
As 89 : 21 :: 623 : 147 2nd;
As 89 : 56 :: 623 : 392 3rd.

## History.

MALES AND FEMALES.

1. What is meant by the National Debt? Give the circumstances under which it was first commenced.

*The National Debt* means a large sum of money owed by England to different people from whom it has been borrowed for the purpose of carrying on wars and other expensive undertakings. It originated in the reign of William III., and has since swelled to an enormous sum. The Parliament, knowing that the chief value of the Crown in William's eyes was the increased weight it gave him in continental politics, agreed to furnish large supplies of money for his wars with Louis on condition that he should give to them the chief share in the Domestic Government, to which William agreed. The Parliament, therefore, borrowed money from the newly-established Bank of England and the East India Company, thus incurring the National Debt, which amounted to £16,000,000 at the close of William's reign.

2. Show by a table how William III. was connected with the Stuarts and the Tudors.

Henry VII. (Tudor) *m.* Elizabeth of York.
|
Margaret *m.* James IV. of Scotland.
|
James V.
|
Mary, Queen of Scots.
|
James I. England *m.* Anne of Denmark.
|
Charles I. *m.* Henrietta Maria of France.
|
Charles II. | James II. *m* Anne Hyde. | Mary *m.* William of Orange.
|
Mary *m.* William III. | William III. *m.* Mary of England.

3. What is a Convention Parliament? Give the dates of all you know, with a full description of any one of them.

A Convention Parliament is an assembly of members called together for a special purpose, by power less than royal.
In 1660 A.D. After the Long Parliament.
„ 1688 A.D. „ Flight of James II

The Convention called together in 1660 consisted chiefly of Cavaliers and Presbyterians. It was this assembly that voted for the Restoration of the Stuart Line. The chief matters which demanded their attention were the settlement of the revenue, dismissal of the army, and the question of indemnity. They granted Charles the taxes and duties of tonnage and poundage for life, and in place of the abolished military tenures a duty was placed on beer and other liquors. One of the most difficult subjects which required their decision was what steps should be taken to reinstate the Church and clergy, but when the Convention was dissolved no real terms of settlement had been accomplished.

## Teaching.

Write notes of a lesson on *Water* or *Air*.

Notes of a Lesson—AIR.

| *Matter.* | *Method.* |
|---|---|
| *Introduction.*—The air is often termed the atmosphere. It envelopes both land and water, and is supposed to extend to an height of forty miles or more. | To live we must breathe. What do we breathe? Air; atmosphere = two words of classical origin, one meaning a globe and the other vapour. |
| *Composition.*—Air pure and dry[2] consists chiefly of two gases, oxygen[3] and nitrogen, mixed together though not chemically combined. With these are mixed some minute quantities of carbonic acid, ammonia, and watery vapour. | [2] When moisture prevails in the air it tends to destroy the clearness. |
| | [3] Show that we take into our lungs oxygen and emit carbonic acid. |
| *Its characteristics.*—The atmosphere is highly elastic, transparent, and invisible.[4] It has also weight. Proofs—because smoke, balloons, and clouds all rise and float[5] in the upper regions, hence they must be lighter than air. | [4] Have a few simple proofs given for each of these. Might explain this by means of some light material, as cork and a vessel of water. |
| *The Atmosphere and Light.*—Air has important relations to light. It not only absorbs light, but it disperses it, reflects it and refracts[6] it. It is to refraction that we owe that light which is commonly known as 'twilight.' | [5] Explain these by means of diagrams sketched on blackboard. |
| *Uses.*—The air[6] supplies our lungs with oxygen, which is necessary for the purification of the blood. It is *the* support of flame, and is required for all animal life. It assists in the determination of the climate of a country, and it distributes light and heat over the surface of the earth. | [6] Might show by means of a lighted candle being placed in a closed glass vessel, that it will soon die out. Why? Because it has used all its oxygen. Just the same rule applies to all animals. |
| *Recapitulate.* | |

## Music.

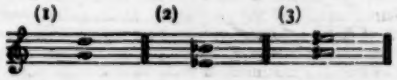
OLD NOTATION.

*A quarter of an hour allowed for this paper.*

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

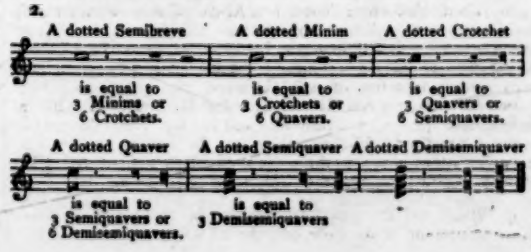
1. Write perfect fifths above the following notes:—

1. (1) (2) (3)



2. Make a table of dotted notes and their value. Place beside each the corresponding rest.

2.


A dotted Semibreve
A dotted Minim
A dotted Crotchet
is equal to 3 Minims or 6 Crotchets.
is equal to 3 Crotchets or 6 Quavers.
is equal to 3 Quavers or 6 Semiquavers.
A dotted Quaver
A dotted Semiquaver
A dotted Demisemiquaver
is equal to 3 Semiquavers or 6 Demisemiquavers.
is equal to 3 Demisemiquavers

3. Explain briefly the following terms:—(1) *Andante*; (2) *Crescendo*; (3) M. 60; (4) *Allegro.*

3. (1) Going easily, slow; (2) becoming louder; (3) "M. 60" means that the pendulum of the Metronome is to make 60 movements a minute; (4) quick, lively.

### TONIC SOL FA NOTATION.

1. Write perfect fifths above the following notes:—(1) *soh*; (2) *ma*; (3) *te.*

1. (1) *soh* to *ray*[1]; (2) *ma* to *ta*; (4) *le* to *fah*[1].

2. Re-write the following in four-pulse measure, doubling the value of every note and rest:—

|s ,l .s ,f :m . |s ,l :r ,m. |d :r .f |m : ‖

2.

|s .l :s .f |m : |s :-.l |r .m: |d :— |r :f |m :— | : ‖

3. Explain briefly the following terms:—(1) *Andante*; (2) *Crescendo*; (3) M. 60; (4) *Allegro.*

3. (1) Going easily, slow; (2) becoming louder; (3) "M. 60" means that the pendulum of the Metronome is to make 60 movements a minute; (4) quick, lively.

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## FOURTH YEAR.

### Pupil Teachers at end of Fourth Year.

### FIRST PAPER.

*Three hours and a half allowed.*

### Euclid.

MALES.

[All generally understood abbreviations for words may be used.]

1. If a straight line be divided into any two parts, the sqs. on the whole line and on one of the parts are equal to twice the rectangle contained by the whole and that part, together with the square on the other part.

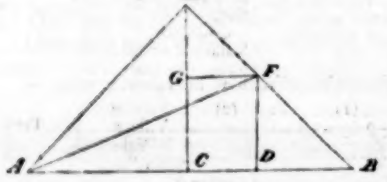
Euclid, Book II., Prop. 7.

2. To describe a sq. that shall be equal to a given rectilineal figure.

Euclid, Book II., Prop. 14.

3. Prove that the sum of the sqs. on the two parts of any line is least when the sqs. are equal.

Construct as in 9, Book II.




Then the sqs. on AC CB shall be less than sqs. on AD DB.

Sq. on AE equals sqs. on AC CB, for CE is equal to CB.

ACE is a right angle (const.) ∴ Sq. on AE = sqs. on AC CE (I. 47).

Because CDF is a right angle, being equal to ACE, (I. 29,) sq. on AF = sq. on AD DF, and DF = DB.

∴ Sq. on AF = sqs. on AD DB.

But AF = sqs. on AE EF, (I. 47,) for II. 9 proves AEF a right angle.

But AE = sqs. on AC CB.

∴ AF², that is sqs. on AD DB, is equal to sqs. on AC CB, together with sq. on EF, that is. sqs. on AC CB are less than sqs. on AD DB by the sq on EF, which is twice the sq. on CD.

II. 9 proves GF = GE, and sq. on EF to be double of sq. on GF, that is CD. (I. 34.)

Similarly, it may be proved that no other two squares (on parts of AB), can be less than sqs. on AC CB, no matter where D may be placed, *i.e.*, the sum of the squares on the two parts of any line is least when the sqs. are equal. Q.E.D.

### Algebra.

(*Answer two Questions.*)

1. Find the value of

$$\frac{a^3-3a^2b+3ab^2-b^3}{a^2-b^2} \div \frac{2ab-b^2}{3} \times \frac{a^2+ab}{a-b}$$

$$= \frac{(a-b)(a-b)(a-b)}{(a+b)(a-b)} \times \frac{3}{2ab-b^2} \times \frac{a^2+ab}{a-b}$$

$$= (a-b) \times \frac{3}{b(2a-b)} \times a$$

$$= \underline{\frac{3a(a-b)}{b(2a-b)}}. \text{ Ans.}$$

2. Simplify:—

$$\frac{\sqrt{x^2+1}+\sqrt{x^2-1}}{\sqrt{x^2+1}-\sqrt{x^2-1}} + \frac{\sqrt{x^2+1}-\sqrt{x^2-1}}{\sqrt{x^2+1}+\sqrt{x^2-1}}$$

$$= \frac{(\sqrt{x^2+1}+\sqrt{x^2-1})^2+(\sqrt{x^2+1}-\sqrt{x^2-1})^2}{(\sqrt{x^2+1}-\sqrt{x^2-1})(\sqrt{x^2+1}+\sqrt{x^2-1})}$$

$$= \frac{x^2+x^2+x^2+x^2}{(\sqrt{x^2+1}-\sqrt{x^2-1})(\sqrt{x^2+1}+\sqrt{x^2-1})}$$

$$= \frac{4x^2}{1+1} = \frac{4x^2}{2} = \underline{2x^2}. \text{ Ans.}$$

3. Solve the following equations:—

$$\left.\begin{aligned} ax &= by \\ x+y &= c \end{aligned}\right\} \begin{matrix}(1)\\(2)\end{matrix}$$

$$\left.\begin{aligned} ax-by &= 0 \\ x+y &= c \end{aligned}\right\}$$

$$\left.\begin{aligned} ax &= 0 \\ -bx &= -bc \end{aligned}\right\}$$

$$\left.\begin{aligned} ax+bx &= bc \\ x(a+b) &= bc \end{aligned}\right\}$$

$$x = \underline{\frac{bc}{a+b}}. \text{ Ans.}$$

Substituting value of $x$ in (2). Then:

$$\frac{bc}{a+b}+y = c$$

$$y = c - \frac{bc}{a+b}$$

$$y(a+b) = ac$$

$$y = \underline{\frac{ac}{a+b}}. \text{ Ans.}$$

$$(x+z)^2 = 4x+5$$
$$x^2+2xz+z^2 = 4x+5$$
$$x^2+2xz-4x = 5-z^2$$
$$x^2+2(z-2)x = 5-z^2$$
$$x^2+2(z-2)x+(z-2)^2 = 5-4z+4$$
$$x+z-2 = \pm\sqrt{9-4z}$$
$$x = \underline{2-z \pm \sqrt{9-4z}}. \text{ Ans.}$$

$$x^2+\tfrac{1}{12}x = 145$$
$$x^2+\tfrac{1}{12}x+(\tfrac{1}{24})^2 = 145\tfrac{1}{576} = \tfrac{83521}{576}$$
$$x+\tfrac{1}{24} = \pm\tfrac{289}{24}$$
$$x = \tfrac{288}{24} - \tfrac{1}{24} = \tfrac{288}{24} = 12,$$
$$\text{Or } x = -\tfrac{290}{24} - \tfrac{1}{24} = -\tfrac{290}{24} = -\underline{12\tfrac{1}{12}}. \text{ Ans.}$$

### Mensuration.

The area of a circular plot of ground is one acre; what would be the area of the largest square plot of ground which could be cut out of it?

ac. sq. yds.
1 4840 = area of circle.
4840 × ·6366197 = area of inscribed sq.

·6366197
4840
25 4647880
509 29576
2546 4788
3081·2393480 sq. yds.
9
2·154132 ft.
12
1849584
12
22·195008

sq. yds. ft. ins.
3081 2 22·195008. Ans.

## Arithmetic.

FEMALES.

1. At 2½ per cent. per annum find the sum of the interest on £80 for 2½ years, and £750 for 3½ years.

£100 : £80 :: £2½ : $x$
1 year : 2½ years.

$$x=\frac{\cancel{80}\times\cancel{5}\times 9}{2\times\cancel{4}\times\cancel{100}}=\frac{9}{2}=\underline{\pounds 4\ 10s.}\ \text{Ans.}$$

£100 : £750 :: £2½ : $x$
1 year : 3½ years.

$$x=\frac{750\times\cancel{10}\times\overset{3}{\cancel{9}}}{\cancel{7}\times 4\times\cancel{100}}=\frac{27}{4}=\pounds 56\ 5s.$$
$$\underline{4\ 10}$$
$$\pounds 60\ 15s.$$

£60 15s. Ans.

2. Twenty-five cwt. of metal are obtainable from 470 tons of ore from one mine, and 16 tons 18 cwt. from 329 tons of ore from another mine. Find how much higher a percentage of metal can be got from one than the other.

tons. tons. cwts.
As 470 : 100 :: 25 : $x$

$$\frac{25\times 100}{470}=\frac{250}{47}=\underline{5\tfrac{15}{47}\text{ p. c. tons.}}$$

tons. tons. tons. cwts.
As 329 : 100 :: 16 18 : $x$

$$\frac{338\times 100}{329}=\frac{33800}{329}=\underline{102\tfrac{242}{329}\text{ p.c. tons.}}$$

cwts.
102 242/329
5 15/47
97 1111/15463. Ans. No. of cwts. obtained from 100 tons (more than the other).

3. Find the present worth and discount of £8984 5s. due at the end of 6 years at 3½ per cent. per annum.

£121 : £8984¼ :: £100 : $x$

$$x=\frac{\overset{297}{\cancel{36037}}\times\overset{25}{\cancel{100}}}{\cancel{4}\times\cancel{121}}=\underline{\pounds 7425\ \text{Pres. Worth.}}$$

£8984 5s. − £7425 = £1559 5s. Discount.

4. By selling 7 cwt. 2 qrs. of sugar at 6¼d. per lb. a grocer made a profit of 35 per cent. What did it cost him per cwt.?

6¼d. × 112 = £2 18s. 4d. = the selling price per cwt.

£135 : £2 18s. 4d. :: £100 : $x$

20
58
3
175

$$x=\frac{175\times\overset{5}{\cancel{100}}}{3\times\cancel{20}\times\cancel{55}}=\frac{175}{11}=\pounds 2\ 3s.\ 2\tfrac{9}{11}d.$$

27

£2 3s. 2 9/11d. Ans.

## Grammar.

MALES AND FEMALES.

1.

What time the mighty moon was gathering light,
Love paced the thymy plots of Paradise,
And all about him rolled his lustrous eyes;
When, turning round a cassia, full in view,
Death, walking all alone beneath a yew,
And talking to himself, first met his sight;
'You must begone,' said Death, 'these walks are mine.'

Analyse fully the above passage.

ANALYSIS.

| Sentence. | Kind of Sentence. | Con. | Subj. | Pred. | Object. | Exten. |
|---|---|---|---|---|---|---|
| (*a*) What time Love paced the thymy plots of Paradise | Princ. Sent. | | Love | paced | the thymy plots of Paradise (direct) | what time (time) |
| (*b*) The mighty moon was gathering light | Adv. Sent. of Time sub. to (*a*) | | the mighty moon | was gathering | light (direct) | |
| (*c*) And all about him rolled his lustrous eyes | Prin. Sent. cop. co-ord. with (*a*.) | and | he (und.) | rolled | his lustrous eyes (direct) | all about him (place) |
| (*d*) When turning round a cassia, full in view, Death walking all alone beneath a yew, and talking to himself, first met his sight. | Adv. Sent. of Time sub. to (*a*) and (*c*.) | when | Death full in view walking all alone beneath a yew and talking to himself | met | his sight (direct) | first (time) turning round a cassia (place) |
| (*e*) Death said | Princ. | | Death | said | (Sent. *f*. and *g*.) | |
| (*f*) You must begone | Noun Sent. sub. to (*e*.) | | you | must begone | | |
| (*g*) These walks are mine | Noun Sent. sub. to (*e*) co-ord. with (*f*) | | these walks | are mine | | |

2. Paraphrase the above passage.

Love was walking slowly to and fro among the fragrant beds of Paradise, just as the moon began to rise, and observing everything that was going on with his bright and shining eyes, when he suddenly beheld, standing under the shade of a tree, no one with him, and apparently in deep thought, Death, who, on observing him, said, 'Why do you intrude here? this place belongs to me.'

3. Give the names of the principal writers of the 'Augustan' age of English Literature, with the chief works of any one of them.

John Locke... ... 'Essay on the Human Understanding'; 'Treatise on Education,' etc.
Pepys and Evelyn ... Diaries of the Times in which they lived.
Gilbert Burnet ... 'History of the Revolution,' etc.
Sir Isaac Newton ... 'A Treatise on Mathematics,' etc.
David Hume ... 'A History of England.'
Addison ... ... 'Essays' in the *Spectator*, *Tatler*, *Guardian*.
Daniel Defoe ... 'Robinson Crusoe,' etc.
Alexander Pope ... 'Rape of the Lock,' 'Essay on Man,' etc.
Jonathan Swift ... 'Gulliver's Travels,' etc.
Oliver Goldsmith ... 'Deserted Village,' 'The Traveller,' 'Vicar of Wakefield,' 'She Stoops to Conquer,' etc.
Dr. Johnson ... 'Dictionary.'
Robert Burns ... 'Cotter's Saturday Night,' 'Mountain Daisy.'
William Cowper ... 'Table Talk,' 'John Gilpin,' 'The Sofa,' etc.

4. Give the etymology and the various meanings of the following words:—Kinsfolk, literature, maintenance, manifold, misfortune, munificent, sensation, seclusion, transmit, treacherous.

*Kinsfolk* (from O.E. 'kinrede').—It means—folk or people kindred, or related to each other.

*Literature* (from L. 'litera,' a letter).—The science of letters; learning; the whole body of literary productions.

*Maintenance* (Fr. 'maintenir,' from L. 'manus,' a hand, and 'teneo,' to hold).—To hold by the hand; to keep up.

*Manifold* (composed of two words—'many' from A.S. 'manig,' a multitude, and 'feold,' from A.S. 'fald,' to fold).—Many in number; various in kind.

*Misfortune* (L. 'miseria,' wretched)—Ill-fortune; an evil accident.

*Munificent* (L. 'munus,' a present, and 'facio,' to make).—Liberal in giving; generous.

*Sensation* (L. 'sensus,' to discern by the senses).—Feeling excited by external objects.

*Seclusion* (L. 'secludo'; 'se,' apart, and 'claudo,' to shut).—A shutting out; separation; solitude.

*Transmit* (L. 'trans,' across, and 'mitto,' to send).—To send across.

*Treacherous* (L. 'trado,' to give up or betray).—Faithless; full of treachery.

## Geography.

1. Write what you know about the moon.

The moon is a planet which attends the earth in its revolution round the sun.

*Dimensions.*—The diameter of the moon is 2000 miles, its area 15,000,000 square miles, and its distance from the earth 240,000 miles.

*Appearance.*—To the naked eye some parts of the moon look darker than others. When looked at through a telescope it presents the appearance of a cold cinder. Its surface is covered with mountains, isolated peaks, and continuous ranges, and the parts which look bright to the naked eye are the elevated portions of its surface, whilst the dark spots are the valleys and plains. There is no air or water, and, consequently, no vegetable life.

*Motions.*—The moon has three motions, namely,—

(1) It revolves round the earth once in 29½ days.

(2) It rotates on its axis once in 29½ days. In consequence of this rotation being completed in the same time as its journey round the earth, we always see the same side of the moon.

(3) It accompanies the earth in its annual journey round the sun.

*Phases of the Moon.*—The moon of itself is a dark body reflecting the light of the sun. When the moon is between the earth and the sun the whole of the illumined side is towards the sun, and the dark side towards the earth. Therefore we do not see it, and it is now new moon (diagram accompanied, to which the letters refer). When the moon reaches B a thin crescent of light is visible from the earth, and it is now said to be 'horned.' At C half the illumined side is seen, and it is said to be in its 'First Quarter.' Still further on, at D, three-quarters of the side is visible, and it is now termed 'Gibbous.' When the moon has reached E, the whole of the side lighted up by the sun is seen, and it is 'Full Moon.' As the moon has thus waxed (or increased) from New to Full, it now wanes (or decreases) from Full to New, being 'Gibbous' at F in its last quarter at G, and 'horned' at H. It has now arrived at A again, where it is once more New Moon.

2. Describe the physical features of the Soudan, naming also its various divisions, chief towns, and saying what you can of its inhabitants.

THE SOUDAN.

*Physical Features.*—The Soudan consists for the most part of a fertile plain lying between Upper Guinea and the Barbary States, and between Senegambia and Nubia. The W. part is watered by the River Niger and its tributary, Chadda. This river is 2,300 miles long, and was explored by Mungo Park. Further to the E. is L. Tchad, into which flow the rivers Yeou and Shary. The E. part, bordering on Nubia, contains vast tracts of desert land.

*Divisions.*—The Soudan is divided into many Negro states, and on this account has been called Nigritia. The chief are:—Bambarra, Timbuctoo, Bornou, Howsa, Borgou, Begharmi, Dar Saley, and Darfur.

*Chief Towns.*—The chief towns are:—

Sackatoo, capital of Howsa, and the largest town of the Soudan.

Timbuctoo, noted for its great trade by caravans.

Sego, in Bambarra, where Mungo Park discovered the Niger.

Boussa, where Mungo Park was drowned in the Niger.

Warra, capital of Dar Saley.

Cobbé, capital of Darfur.

*Inhabitants.*—The inhabitants belong chiefly to the Negro race. Many of them are nomadic, especially in the E., where they are called Bedoueen Arabs. The people generally are more civilised than those of Senegambia and Guinea. The religion of the majority is Fetichism, but the Arabs in the E. profess Mahometanism.

3. Compare the Atlantic and the Pacific Oceans.

The Pacific is the largest of the oceans, extending over an area nearly four times as great as the Atlantic. But, on the other hand, the Atlantic is the best known and most used for navigation.

The *shape* of the Pacific is a vast oval, whilst that of the Atlantic is somewhat like a canal, leading from the Arctic to the Antarctic Ocean.

The *shores* of the Pacific are high, the mountains coming near to the coast, but the shores of the Atlantic are low, and the mountains far removed from them.

The Atlantic, although the smaller ocean, has larger and more numerous rivers running into it than the Pacific, thus we have the Amazon, Mississippi, St. Lawrence, La Plata, Rhine, Rhone, Nile, Niger, etc.

The Pacific is noted for the *islands* scattered over its surface, whilst the Atlantic is noted for the number and size of its *openings* and inland seas.

## SECOND PAPER.

*Two hours and a half allowed.*

## Needlework.

FEMALES.

(*One hour only must be given to the Exercise in Needlework.*)

Set in a calico patch about three inches square, and mark on it the letter K and the figure 5.

## Arithmetic.

MALES.

1. A landlord having a farm of 102 acres, previously let at £2 an acre, thrown on his hands, lets it out in 3-rood lots at 15s. a rood and a bushel of potatoes for every lot. If he increases his income by £340, what is the value of potatoes per bushel?

102 ac. at £2 = £204

Rood 15s. ∴ An acre = £3

So he gains £102 by raising the rent.

But he increases his income by £340.

∴ £340 − £102 = £238 value of potatoes.

136 lots are let out.

So £$\frac{238}{136}$ = £1 15s. value of potatoes a bushel.

£1 15s. Ans.

2. In a school of 1400 children 56·25 per cent. are girls, who earn $\frac{7893}{13854}$ of a grant of £1400. If the number of failures of the boys be 7 per cent., what is that of the girls?

Girls = 56·25 per cent., or 787·5 ) $\frac{7893}{13854} \times \frac{1400}{1} \times \frac{285}{700} = \frac{1893720}{351}$ £

Boys = 43·75 „ 612·5 )

251

Girls earn £$\frac{1353480}{351}$ ∴ Boys earn £$\frac{1893720}{351}$

As 100 : 7 :: 612·5 : $x$ = 42·875 boys who failed.

As 569·625 : 612·5 :: £$\frac{1353480}{351}$ : $x$ = £$\frac{1893720}{351}$

Had all boys passed they would have earned £$\frac{1893720}{351}$.

£$\frac{1893720}{351}$ − £$\frac{1353480}{351}$ = £$\frac{540240}{351}$ = loss by boys' failures.

boys. girls. £ £

As 612·5 : 787·5 :: $\frac{540240}{351}$ : $\frac{x}{351}$ Possible grant for girls.

£$\frac{1400}{351}$ − £$\frac{388080}{351}$ = £$\frac{1011840}{351}$ loss by girls' failures.

£ boy fail.

As $\frac{1011840}{351}$ : $\frac{1440}{351}$ :: 42½ : $x$ = 39·375 girl failures.

As 787·5 : 39·375 :: 100 : $x$ = 5 per cent.

No. of failures of the girls = 5 per cent. Ans.

3. In how many years would 1d. amount to £1 at 10 per cent. per annum?

Before 1d. can amount to £1 it must gain 239d.

100 will gain 10 in 1 yr.

1 „ „ „ 100 yrs.

1 „ 1 „ 10 yrs.

1 „ 239 „ 2390 yrs. Ans.

4. What is the insurance on £12,000, if I so insure as to save the premium as well as the property in case of loss?

The amount insured for in this case depends upon the rate of premium.

Let 4 per cent. be the rate.

£ £ £

As 96 : 12000 :: 100 : $x$

£12500. Ans.

## History.

### MALES AND FEMALES.

1. What are the advantages and disadvantages connected with England having such a large colonial empire?

1. The advantages are:—

(1) The commerce of England is enlarged.

(2) England finds a ready mart for her manufactured goods.

(3) England obtains a supply of colonial produce and other articles not produced at home, from her colonies.

(4) The colonies afford a place to which people can emigrate when the country would otherwise be overstocked.

(5) If a war were to break out against a nation in any part of the world, England would have a friend and ally in her colonists.

The disadvantages are:—

(1) England must protect her colonies, and, therefore, may be obliged to engage in foreign wars, with which she would otherwise not interfere.

(2) Money is taken out of the country by the people who emigrate.

(3) Her power and forces are scattered, and could not be concentrated in one place.

(4) Her responsibilities are increased.

2. Give an account of the changes in the representation of the people during the present century.

The Irish rebellion of 1798 showed the necessity of binding Ireland more closely to Great Britain. Consequently in 1801 the union of the Parliaments was accomplished. Ireland was to send 32 lords and 100 commoners to the Imperial Parliament. No further change in representation occurred until 1832. Then Lord John Russell introduced and succeeded in passing a Reform Bill. Three great changes were thus made, viz., the right of sending members to Parliament was taken away from places not containing 2000 people. Several towns which had sprung into important places were now first represented; and the franchise was more widely distributed among the middle classes. The right of voting in towns was given to the owners, or to the tenants of houses worth £10 a year. County members were permitted to vote who owned land worth £10 a year, or who paid a yearly rent of at least £50.

The Chartist Agitation of 1848 showed that the people were not all pleased now with their representation. Accordingly in 1867 another Reform Bill was passed, by which the Franchise was still further extended. It conferred the borough franchise on every occupier of a dwelling-house rated for the relief of the poor, and on every holder of an unfurnished lodging at the annual value of at least £10. In counties a property franchise was given on holdings of £5 yearly value, and an occupation franchise on lands rated at £12 a year. In 1884 the Gladstone Government still further extended the franchise, all householders having a vote.

3. What led to the loss of the American colonies in the reign of George III.?

The War of American Independence, which continued with varying successes during eight campaigns (from 1775-1781), led to the loss of the American colonies. The Seven Years' War, which opened during the reign of George II., and continued until 1762, had left a heavy debt on England; and as it had been waged in defence of the North American colonies, many English statesmen considered it would be right to tax these colonies for the purpose of helping to pay the expense. The colonists, on the other hand, contended that as they were not represented in the English Parliament, it had no right to impose taxes on them without their consent.

Notwithstanding the warning of the great statesman, Lord Chatham, taxes on tea, lead, glass, paper, and painters' colours, were laid on the colonists, whose discontent grew hourly greater.

The taxed tea was still sent out to America, but the resistance of the States never wavered. Some twenty daring spirits, dressed and painted like Indians, boarded the ships which lay in Boston Harbour, and emptied the tea-chests into the sea (December, 1773). The British Government then shut up the Port of Boston, and transferred the appointment of the Council of Massachusetts from the people to the Crown. This brought matters to a crisis.

In the same year twelve States sent delegates to a Congress, held at Philadelphia, where they drew up a Declaration of Rights, and prepared to resist the infringements of their liberties. In vain the Government, supported by the influence of the King, determined to persist, and a struggle became inevitable. After ten years of wordy strife, actual war began, which lasted with varying successes from 1775-1781. During the seventh campaign a great disaster befell the British arms. Lord Cornwallis was, by the skilful movements of Washington, shut up in Yorktown, and compelled to surrender with 7,000 men. This was the decisive blow; and although the war lingered through another campaign, the American colonies were now virtually severed from the British Empire.

4. Name, in order of date, a dozen of the chief events of the reign of Victoria.

| | |
|---|---|
| Chinese War ... ... | 1838 |
| Sikh War ... ... | 1845-1849 |
| Repeal of Corn-Laws ... | 1846 |
| Crimean War... ... | 1854 |
| Indian Mutiny ... ... | 1857 |
| Irish Land Act passed ... | 1870 |
| American Civil War... ... | 1861 |
| Second Afghan War... ... | 1878 |
| Zulu War ... ... | 1878-1879 |
| Second Irish Land Act passed | 1881 |
| War in Egypt ... ... | 1882 |
| Egyptian War ... ... | 1885 |

## Teaching.

Write notes of a first lesson on Subtraction for Standard II., or Long Division for Standard III.

### SIMPLE SUBTRACTION.

| Matter. | Method. |
|---|---|
| I. *Meaning of Subtraction.* By means of subtraction we take away one number from another. | Illustrate by example, *e.g.*, 'A boy had 9 apples; he gave away 4. How many had he left?' To obtain the answer we use 'subtraction.' |
| II. *The different value of numbers used.* The value of a figure increases tenfold by placing it one point further to the left. | Illustrate by showing that 1 consists of one unit, 10 equals ten units, 100 equals 10 times 10, etc. |
| III. *Subtraction without borrowing.* Best explained by an example:— 9864 / 2803 / 7061 | Show that we must be very careful to put the right figures into the right places—units under units, tens under tens, etc. All we have then to do is to take the bottom number (the subtrahend) from the upper number (the minuend). We begin at the right, or at units place, and take 3 from 4. The remainder is 1. Now we subtract 0 from 6. 6 remains. Similarly treat the other figures. |
| IV. *Subtraction with borrowing.* Example:— 56108 / 29376 / 26732 | After the children thoroughly understand the preceding example, let them try one like this:— 6 from 8 leaves 2, 7 from 0? We cannot take 7 from nothing. What must we do? Teacher will now refer to what has been said about the figures to the left, viz., that they are ten times the value. Then show that we *borrow* 1 *ten* and add to the number. We say now, not 7 from 0, but 7 from 10+0, *i.e.*, 7 from 10. The remainder is 3. By great care the teacher will now show that, by borrowing 10, we affect the next figure. When we borrow we must pay back. Whenever we borrow 10, we must, therefore, carry 1—that is, one ten—and add to the next bottom figure. (Much explanation will be necessary here.) |

We next say 1 and 3 are 4; 4 from 1 we cannot; borrow 10 and add to the 1; that makes 11. 4 from 11 leaves 7. Put down 7 and carry 1. Similarly treat the remaining figures. It must be strongly impressed on the children not to carry unless they borrow.

V. *Examination.*

83,016
29,807

5030
908

etc.

Interrogate on the reason of borrowing, and how it affects the next figure. Examples should then be given to the class to work, the teacher commenting upon any mistake that may occur.

### Music.

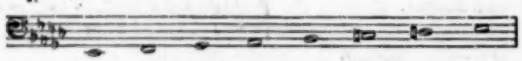
#### OLD NOTATION.

*A quarter of an hour allowed for this paper.*

(N.B.—Pupil Teachers may answer the questions in either the Staff Notation or the Tonic Sol-fa, but *not both*. The questions in the Tonic Sol-fa Notation will be found at the end.)

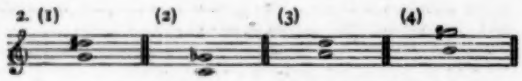
1. Write in the Bass clef the ascending scale of E♭ minor, using the sharp sixth and seventh.

1.



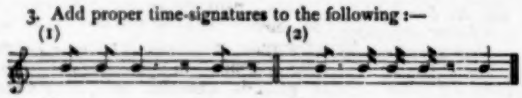
2. Write above (1) an augmented fifth; above (2) a diminished or minor fifth; above (3) a perfect fourth; above (4) a major sixth:—

2. (1) (2) (3) (4)

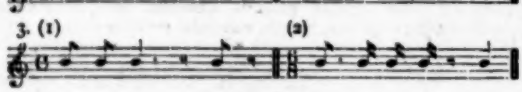


3. Add proper time-signatures to the following:—

(1) (2)



3. (1) (2)



#### TONIC SOL-FA NOTATION.

1. Write (1) above *soh* an augmented fifth; (2) above *doh* a diminished fifth; (3) above *lah* a perfect fourth; (4) above *te* a major sixth.

1. (1) *re*; (2) *fe*; (3) *ray*; (4) *se*.

2. Write the following in two-pulse measure by dividing the value of each note by three:—

| s :d :— | l :m :s | r :— :m | d :— :— ‖

2.

| s ,d ,— :l ,m ,s | r ,— ,m :d ‖

3. Say what are the points of difference between the *doh* and the *lah* modes, and give the various forms of the latter.

3. The *doh* mode is the major mode, and the *lah* mode the minor. They differ from each other in two notes—the third and the sixth. The major mode has a major third above its tonic, and the minor mode has a minor third. The *doh* mode has a leading-note.

The *old form* of the *lah* mode had no leading note.

Old Form l, t, d r m f s l

Revised Forms { l, t, d r m f se l
l, t, d r m ba se l

## The Changes in the Education Code.

THE important changes made this year in the Code are few, but necessitate a considerable number of verbal alterations in the various articles of that document. As a matter of fact, the appendix containing the schedule of alterations is longer than it was last year, but a careful examination of it shows that the numerous minor changes cluster round the two or three new principles introduced this year.

The first, and by far the most important, change is the introduction of drawing as an additional class-subject to be taught systematically throughout the various Standards. In Article 16 (*b*) 'Drawing' is introduced as one of the optional subjects, and stands immediately after 'English,' thus indicating that drawing should be considered of next importance to that subject. This is also shown by the new Article 109 (*f*) (v.), which awards the second place to Drawing, giving it precedence over Geography, Elementary Science, History, and Needlework. *Three* class-subjects may now be taken, instead of *two* as heretofore, and grants will be paid on the additional subject. Article 109 (*f*) (viii.) states that Drawing cannot be taken as a class-subject unless it is taught by a teacher holding the 2nd Grade Drawing Certificate, or who earned grants on freehand, model, or practical geometry in the year 1884. In the schedule of class-subjects (Schedule II.) a progressive course of instruction in Drawing is sketched out. The requirements for the first three standards, though to some extent inappropriate, are not excessive; but those for Standards IV., V., VI., and VII. are certainly beyond the present possibility of attainment in the majority of the elementary schools. It is understood that the Education Department will shortly issue special instructions respecting the examinations in drawing, which will be conducted by the art inspectors, and that the change will not be enforced until 1886.

The introduction of systematic instruction in drawing into all elementary schools is a direct result of the report of the Commissioners on Technical Education. We note that the National Union of Elementary Teachers at their Conference, held recently at Norwich, recognised the value of the subject, and expressed a desire to improve the teaching of drawing. The conference, however, condemned the principle of making it a class-subject, and complained of the schedule of requirements contained in the Code. We trust the Department may see its way to modify the proposed arrangements, and to allow of a separate classification of the scholars in this subject, as is already permitted in the teaching of 'Singing.'

The second change of importance is that relating to the engagement and examination of Pupil Teachers. Previously, the engagement of a pupil teacher always commenced at the beginning of the school-year; now it may begin either at that date or on the 1st of January. Up to the present time collective examinations of pupil teachers have been held monthly; in future these examinations will take place only twice a year—in April and October. 'At such examinations, those pupil teachers are examined who begin a new year of their engagement in the course of the six months next following such examination.' No inconsiderable number of our young friends will thus be called upon to meet their next examination much earlier than

they expected. We trust they will be prepared, and that some consideration will be shown to them by Her Majesty's inspectors. The main object of the change appears to be, to facilitate the instruction of the pupil teachers at central classes, such as those established in London, Liverpool, and other large towns. There are changes also made in several other articles relating to pupil teachers, in Schedule V. (*Qualifications and Certificates of Pupil Teachers*), and in Schedule VI. (*Memorandum of Agreement*). These alterations demand increased care in the production of certificates of health, character, and conduct, and require that the *homes* of candidates should be certified as suitable. The Memorandum of Agreement is considerably altered and improved, and the same may be said generally of the course of instruction laid down in Schedule V.

The third important change occurs in the second Schedule, and has reference to the grouping of scholars for the class-subjects. Previously a certain amount of liberty was given to teachers to group the children in the upper Standards for instruction in these subjects, but under the new form of the foot-note to the Schedule, the manager may submit to the inspector 'progressive schemes of lessons in these subjects' other than those set forth in the Schedule, 'providing for not less than three groups.' This should be a great relief to small schools, and introduces, for class-subjects at least, much greater liberty of classification. We trust the teachers of schools in rural districts will not fail to take advantage of the concession made by the Department.

The change made in Article 109 (*h*) is in the direction of making the teaching of Cookery more thorough and practical. It is now necessary, in order to obtain the grant of four shillings per head of those presented for examination—(1), that the instruction is given 'by a teacher holding a certificate from some training school of Cookery'; (2), that the pupil shall have attended the Cookery class at least 40 hours in the year; and (3), that not less than 20 hours have been spent by the pupil 'in cooking with her own hands.' It is further very properly stipulated that no grant will be made 'on account of any girl who is presented for examination in more than one specific subject.'

Among the minor changes we may note—(1), that managers are now bound to provide not only a copy of the Code, but also a copy of the 'Revised Instructions' for use in their schools (Art. 8 c.); (2), that where the number of infants in a school is insufficient to form an infant class, 'they should be instructed suitably to their age' (Art. 108); (3), that the same number of class-subjects must be taken throughout the school [Art. 109, (f.) (w.)]; and (4), that the grant may be reduced by not more than one half 'for failure on the part of the managers to exercise due care in the supervision and verification of the registers' [Art. 115, (i.)]. The changes made this year in the Code render changes in the 'Instruction to Inspectors' also necessary, and we are informed that the 'Revised Instructions' will be issued early in May. We trust the additional class-subject will not tempt managers or teachers to further overpress the scholars under their care. The temptation of an extra grant is strong, but it should be carefully resisted, and a specific subject should be dropped, if three class-subjects are attempted.

## Books of the Month.

'Reading,' says Francis Bacon, 'maketh a full man.' If my Lord Chancellor had seen the reader of our present-day novels in his mind's eye he would have written that it maketh a weary man. To read through the dozens of 'works of fiction' that appear week after week is a sad and depressing task. To feel at the end of all one's toil that, for the most part, the quality of the books is in inverse ratio to their quantity is even sadder and more depressing.

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Mr. Hall Caine's 'Shadow of a Crime' is, perhaps, the most interesting of recent publications. It is one of those books to divulge the story of which is unfair to the author. We can only, therefore, say, that its hero—or rather its chief hero—is one Ralph Ray, a Cumbrian dalesman, who fights for freedom in the Parliament army. How he is accused of treason and murder, how he 'comes through,' readers must find out for themselves. A more original character than that of Ralph is his friend, Sim—a man timorous, almost cowardly, by nature, but who undergoes his long martyrdom with a heroism that is full of pathos. His daughter, Rotha—the heroine—strikes us as more commonplace. We have met her before in many a novel. The book is overloaded with characters, some among so many being necessarily mere shadows. One of the most interesting portions of the book is that which deals with the hideous torture of pressing to death, a form of punishment which, it is necessary to remind modern readers, was still in vogue in the last century. Whatever the faults of the book, at least Mr. Caine can write English, and, taken all in all, we feel no sense of guilt in recommending his work to the subscribers to Mudie's.

***

'A Perilous Secret' has been running through some of the magazines, and has now appeared in book form. It is sure to be popular. It is full of the sensations and excitement many novel-readers love, and, moreover, it is Charles Reade's last book—or, to be more accurate, the last book published under his name; for it is only fair to remember that Mr. Henry Pettitt claims to have entirely invented the 'plot and construction' of the story. It was originally the subject-matter of a play at the Adelphi, when Mr. Pettitt's name appeared as joint author. In the novel his share in the work is ignored. If Mr. Pettitt's statement is correct, this is manifestly unjust.

***

Another story of the sensational class is Mr. Charles Gibbon's 'Hard Knot'; and it at once recalls the great 'success' of the season, Mr. Farjeon's 'Great Porter Square.' In each case we cannot help feeling—perhaps quite unjustly—that the story is familiar to us, and that both are founded upon one common original, though we cannot call to mind what that original is. In both books we have a murder (though, to be sure, the objects for the murder differ), a wrong scent, a false charge, the hiding of the real murderers in the most improbable of places—*i.e.*, at the scene of the murder—and finally their death by fire. The 'Knot' is both tied and untied a little clumsily; but readers of this special class of literature are not given to being hypercritical, and this book is likely enough to please them.

***

Walter Besant is always readable, and usually very charming. Under the title 'Uncle Jack,' he publishes five short stories of what he has himself christened the 'impossible' kind, stories which cannot fail to amuse his readers. One of them, 'Julia,' reminds us, and not unpleasantly, of Dickens.

***

In Mr. T. B. Aldrich's 'Queen of Sheba,' we have another of the stories of the new American 'school,' which make no pretence to plot, and content themselves with subtle—or what would be subtle—analysis of character. This is permissible—nay, very interesting—in the hands of a writer like Mr. Henry James, but curiously

irritating and wearisome in his imitators, like Mr. Aldrich. The humour of the book is forced, the descriptions (the action takes place in New Hampshire and Switzerland) are tiresome to a degree, the characters hopelessly commonplace, and the 'moral problem'—indispensable to the books of Henry James and his followers—is no problem at all.

***

Lady Hope's 'A Simple Life' is chiefly remarkable for the conventionality of its characters and the horrible English in which it is written. One feels inclined to present Lady Hope with some simple little book on grammar.

***

The chief virtue of Miss Mabel F. Robinson's 'Mr. Butler's Ward' is that it is in one volume. Mrs. Bogen's 'Elfrida'; A. M. U.'s 'Unhired Labourer'; Mary Chicele's 'Doing and Undoing'; Miss Theogift's 'Lil Lorrimer'; Miss Nevil's 'A Future on Trust,' are among the other books of the month, but are not worthy any detailed notice.

***

A book all lovers of that much maligned, and little understood animal, the cat, should read is Mrs. Cashel Hoey's translation, 'with supplementary notes,' of M. Champfleury's 'Cat, Past and Present.' The original work is a delightful one, and the translation is good and careful. Among the many 'supplementary notes,' we are glad to see Théophile Gautier's delicious account of his cats. We feel assured that after reading this volume, and bearing in mind how many great men have been the friends of cats, no one will ever again venture to assert that cats are treacherous, or not affectionate and devoted—as distinct from canine servility—to their protectors and well-wishers. Altogether a book well worth reading.

***

Of the biographies of the month, the most interesting is that of Abraham Lincoln, by his friend Isaac U. Arnold. The story of this noble, good man's life has often been told, but never in a fashion worthy the subject. Mr. Arnold—who, besides his personal intimacy with Lincoln, had access to many private papers—has at last given us the long-needed 'Life.' Mr. Arnold tells us that since the day when Lincoln was murdered he has been 'an earnest and unwearied student of his life, character, and public acts; and it has been his ambition to prepare a thorough and careful memorial of the man, and of the great services he rendered his country and his age.' Mr. Washburne furnishes an introduction to this volume, in which he compares Mr. Arnold, as a historian, to M. Thiers, whom he considers 'the greatest historian of modern times.' This some of us may consider a doubtful compliment. As a matter of fact, Mr. Arnold is as superior to M. Thiers as a biographer as the subject of his biography was superior to Napoleon I., whom M. Thiers sought to deify. Much in this book is so delightful that we are sorely tempted to make extracts; but there is so little space at our command, and such an *embarras de richesse* of good things, that we must needs refrain. It is interesting to note that Abraham Lincoln, like many another great man, owed not a little of this greatness to his mother.

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At the present moment, Colonel Malleson's 'Russo-Afghan Question' and Mr. Sutherland Edwards's 'Russian Projects against India' are sure to be read with great interest. While on the subject of Russia, let us call the attention of the readers of the PRACTICAL TEACHER to Stepniak's new book, 'Russia under the Tzars,' which is to be issued about the 21st of this month, and which is sure to be what our German friends call 'epoch-making,' and to a most extraordinary article that is to appear very shortly in the *Nineteenth Century*. The article in question is by a Russian gentleman, neither a revolutionist, Socialist, nor Nihilist, who tells us what hideous persecution for no greater crime than wishing to publish scientific and educational journals, drove him 'to leave his country' and become an exile.

***

Two most entertaining and instructive books have just appeared on China. The first, 'The Chinese, painted by Themselves,' is translated from the French, and is written by a Chinaman, Colonel Tcheng-ki-Tong, Military Attaché of China at Paris. Those who want to know much of life in China that can only be known to a 'heathen Chinee' himself would do well to study this work. That Colonel Tcheng-ki-Tong gives a rather rose-coloured account of the Land of the Sun is natural enough; that he should speak somewhat satirically of our so-called Western civilisation not less natural. Not the least interesting portion of this interesting work is that which deals with the national proverbs and poetry of China. The second book on the Celestials is by a lady who has dwelt for many years among them. It deals with 'Child Life in Chinese Homes,' and contains an immense amount of information, brightly and pleasantly conveyed. The chapters dealing with 'Boys at School,' with the up-bringing (when allowed to live!) of Chinese girls, and the games and amusements of the little ones, are perhaps the most interesting. The torture to which Chinese girls are subjected to reduce their feet to the size worthy of the poetical designation of 'golden lilies,' is horrible, and yet not so much worse, and probably less really injurious to health, than the tight-lacing that disfigures our own girls.

***

George Eliot's life, as told by Mr. Cross, is still occupying the magazines. The April number of *Temple Bar* contains one of the best of the many articles on the subject. Rumour assigns this very clever review to a popular lady-novelist. The same number of the same magazine contains another article well worth reading—a most sympathetic essay on the 'Memoirs of George Sand.' It is interesting to compare and contrast the lives of both the great Georges.

## Publications Received.

**Blackie and Son—**
A Synopsis of Scottish History. By H. Willis.
Outlines of the World's History. By E. Sanderson, M.A.
Map-Drawing Books. Standards III. to VII.
Home Lesson Books and Geographical Readers. Standards V., VI., VII.

**Didsbury, G. (Wellington)—**
Health for the Maori. By J. H. Pope.

**Heywood (John)—**
The Combined Writing and Rudimentary Drawing Copy Book. No. 5.
Tales for Composition. By A. Gardiner.
The 'Dot' Parsing and Grammar Notes.

**Hodder and Stoughton—**
Bell's Ladies' Reader.

**Longmans and Co.—**
Longman's Magazine. April.
Longman's Geographical Reading Book: The British Colonies and Dependencies.
A Collection of Maps and Plans. 1760-1815.

**Murby (T.)—**
Murby's Scripture Manual: Philippians.
Heat and Sound. By R. Wormell, D.Sc., M.A.

**National Society's Depository (The)—**
The English History Reading Books. Parts 1 to 5.

**Philip (G.) and Son—**
Philip's Illustrated Standard Poetry Book.
Sovereigns of England, from Egbert to Victoria. By T. Haughton.

**Rice (W.)—**
Hints on French Syntax. By F. Storr.

**Smith, Elder, and Co.—**
The Cornhill Magazine. April.

**Stanford (E.)—**
A Handbook of Translation: Part I. Latin.

**Swan Sonnenschein (W. & Co.)—**
History of Pianoforte Music. By J. C. Fillmore and Ridley Prentice.
Time. No. 4. New Series. April.

**Wesleyan Methodist Sunday School Union (The)—**
Ivy Chimneys. By Edith Cornforth.

## Publications Reviewed.

**History of Philosophy.** By J. D. Morell, A.M., LL.D. London: Stewart and Co.

With the many treatises on this subject already to hand in different languages, we cannot but come to the conclusion, after carefully reading the work of Dr. Morell, that he would have done more wisely to have translated, say Ueberweg, than have issued his own volume. It is true that he tells us at the outset that his manual 'is intended to serve the purpose rather of an introductory course to the comprehension of the main philosophical systems presented to us in the history of human thought than a complete or technical exposition of them.' Yet the manual reaches nearly 600 pages. This length, that we are compelled to think is inordinate for a mere introduction to the recognised histories of philosophy, is due to Dr. Morell's habit of controversy. His history is a criticism—at least it is a criticism whenever he is recording opinions with which he does not agree. The whole interesting question of the dispassionateness of a historian of philosophy is too intricate to be discussed here. But, for ourselves, we declare at once in favour of educational manuals on such a subject as this being written by scholars who are content with putting clearly and fairly the case of each philosopher, without recording their own 'Hear, hear' in his favour, or the protesting 'No, no' of their adverse criticism. This controversial spirit of the author comes out at the very beginning, in the definition he gives of philosophy, on page 10: 'The reflective use of reason in its effort to comprehend the universe, the mind, and all that we can know of the great first cause of all things.' In the last six words the whole question is, from the point of view of a large number of philosophers, begged. Surely a history of philosophy should start with a definition of the subject-matter acceptable to all the admitted schools of philosophy?

Dr. Morell deals first with the philosophy of Greece (the best part of his book, to our thinking); then with that of mediæval times, with sensational philosophers, with the idealists, and lastly with modern scepticism, mysticism, eclecticism. He uses the Germans hugely, quoting pages on pages from the 'Buch der Weltweisheit,' Noack, and the younger Fichte; whilst, even where no direct quotations are given, the influence of Hegel and others is notably strong. Of the French school Cousin is drawn upon most largely.

Taken altogether, Dr. Morell's style is very pleasant and readable. Here and there a little looseness in the English and an uncertainty of metaphor are to be met with. Why, *e.g.*, '*hemisphere* of human philosophy,' page 64, in which Plato is one of the 'inextinguishable lights'? Occasionally the style degenerates into the commonplace—in such passages as the following: 'When the spirit of independent thinking is once acquired, there are, of course, many different directions which it may follow, and according to the path first struck out will ever be the method and character of the whole subsequent investigation:' 'Public bodies always move more slowly than individuals in the way of reformation, and are the last to throw off old, exploded dogmas.' But, on the whole, his writing, if a little surcharged with sensibility, is considerably above the average. In one or two cases it reminds us of Landor, and than this we know scarcely any higher praise. Before leaving this part of the subject, we must protest very strongly against the excessively careless proof-reading of the book. We had made out a list of the errors we noticed, but they are so many that space forbids their quotation. Their number is at least thirty-four, without reckoning, as printer's errors, two cases that seem to belong to the author, who persistently writes ('refer back' (see page 545, line 8), and 'from whence' see page 117, line 3).

As to the matter of the volume before us, the students who have not access to any of the standard works on philosophy will be grateful to Dr. Morell for the care with which he has arranged the facts of the when and where and the what of his different writers. The book will certainly be of use to any one who wants to get up the chief facts as to the chief thinkers, from Thales to Mr. McTaggart, and to those who wish to become acquainted with the main ideas of these thinkers in outline. The arrangement is systematic, and the author's habit and method of recapitulation are of very great service. The index is poor.

Let us, however, warn the young reader against taking Dr. Morell's criticisms on the schools of thought with which he is in antagonism as in any sense conclusive. He is a strong partisan and a vigorous opponent. But he, as well as his readers, must bear in mind that it is not difficult to gain a victory when the stating of your opponent's case, as well as of your own is in your hands, and your opponent is unheard in his own defence. This we are bound to say, after the unreasonable length at which, as it seems to us, the philosophy of utilitarianism in general, and the ideas of Locke in particular, are discussed adversely. Dr. Morell will forgive us if we apply to him the remarks he makes, on pp. 376, 378, on Reid. On p. 378, we have it that 'Every impartial critic, we consider, must give him credit for the truly philosophical spirit with which he commenced;' and on p. 376, 'When Hume's "Treatise on Human Nature" came forth to the world, and he saw the consequences to which the whole theory must ultimately tend, he began to inquire within himself whether that theory was really a true one.' Now, to inquire whether a philosophical scheme is true *because of the consequences to which it leads* is essentially unphilosophical; and this, which our author admits was the cause of Reid's inquiries, seems to us to be, in some cases at least, the cause of his own criticisms.

The line that Dr. Morell takes will be gathered from one or two passages. Thus, on pp. 187, 188, he maintains that the conditions of an event are not the cause of the event. The obvious answer of the sensationalist is that he can only recognise conditions, and that he believes that when once the full sum of these conditions—or occasions, if Dr. Morell prefers the word—are known, the cause of the event is also known. So strongly does Dr. Morell feel on the point, that he actually commits himself to the astounding statement that 'Potentially the acorn in its little circumference encloses the oak that is to bear the blast of ages,' and that 'Any child, after the first experiment, manifests his conviction in the regularity of the laws of nature as strongly as the octogenarian after the experience of his whole life.' Again he utters the strange, and often refuted, statement: 'If there be a law, surely there must be a law-giver,' forgetting that he is applying to a law of nature—*i.e.*, a verbal generalisation of an observed order of phenomena—the same principles as are applicable to that totally distinct thing (save in name), a law in jurisprudence.

Lastly, it is clear that Dr. Morell has not brought to bear upon his subject the knowledge of physics, or even of physiology, without which no controversial philosopher to-day can enter into the arena. He is not apparently acquainted with physics, and in support of this statement—not a very serious one, had he confined himself merely to matters of history, but a serious one, seeing that he has rushed into controversy—we need quote only one passage: 'The extreme unfitness of the soft and pulpy material of which the nerves are composed to produce or propagate vibrations.'

**Some Thoughts on Education.** Lewisham: The Steam Press, Lee Road.

We have here some thoughts on education by a lady of great refinement, who has pondered deeply over the present educational wants of the country, and subtly analysed the methods of meeting them. To very many readers the value of the little book will be much enhanced by the fact that nearly half of it is composed of extracts from Ruskin's 'Fors Clavigera'—extracts, of course, which have a direct bearing upon some aspects of education.

**Geographical Reading Books.** Edited by F. W. Rudler, F.G.S. The British Colonies and Dependencies. London: Longmans, Green and Co.

The series of Reading Books, of which this is the fifth, has been prepared on the lines of a syllabus of instruction in geography adopted by the Liverpool School Board. This course is not identical with that laid down in Schedule II. of the Government Code, but is of such a character as the Inspectors are authorised to accept. The style in which this fifth book is written is particularly clear and interesting. The opening lessons relate the explanation of various physical phenomena, which cannot be well understood by children in the earliest stages of geographical study, and which can be most suitably illustrated by reference to the widely-extended possessions of the British empire. The book is imbued throughout with the scientific spirit, and in presenting the facts of geography, no opportunity seems to be lost of showing the relation between cause and effect. Thus reason is made to assist the memory, and fact is linked with fact in a chain that cannot easily be broken. The titles of the lessons and the marginal headings of paragraphs show how much attention is paid to this matter of reasoning. Thus Lesson II. is on the distribution of the light and heat of the sun, and its paragraphs clearly show the 'Causes of variation in the amount of heat given to the earth by the sun,' that 'direct rays carry most heat to the earth,' and that the 'amount of sun's heat received by the earth varies with the length of days.' The next lesson gives a most lucid explanation of the parallelism of the earth's axis and its influence, combined with the annual revolution, in causing the seasons. Then follow chapters on the 'Local Causes which Modify Climate'; 'Influence of Climate and other Causes, on the Distribution of Vegetable Life'; 'Influence of Geographical Causes on the People of Different Countries'; 'Causes which Determine the Commerce of a Country'; 'Causes of the Extension of the British Empire.' These lessons are followed by interesting and well-written descriptions of India, the African, American, and Australian possessions of Britain; and two appendices relate to the 'Distribution of Animal Life through the British Dominions,' and describe the 'Lesser British Possessions.' Effective illustrations are introduced in the text, and at the end is to be found a series of maps, neatly engraved and clearly printed on tough vellum-like paper, and so inserted as to be available while the book is opened at any lesson.

**Graduated Exercises in Grammar, with Definitions.** M. Hickey. John Heywood.

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**Lays of Ancient Rome.** New Edition: with Explanatory Notes. London: Longmans and Co.

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